The Printer Working Group

IPP Job Extensions v2.1
(JOBEXT)

Status: Approved

Abstract: This specification defines the "media-col" Job Template attribute and extends the Job management, monitoring, and processing capabilities of IPP.

This is a PWG Candidate Standard. For a definition of a "PWG Candidate Standard", see:

https://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf

This specification is available electronically at:

https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext21-20230210-5100.7.docx
https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext21-20230210-5100.7.pdf

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The Printer Working Group (or PWG) is a Program of the IEEE Industry Standards and Technology Organization (ISTO) with member organizations including printer manufacturers, print server developers, operating system providers, network operating system providers, network connectivity vendors, and print management application developers. The PWG is chartered to make printers and the applications and operating systems supporting them work together better. All references to the PWG in this document implicitly mean "The Printer Working Group, a Program of the IEEE ISTO."

To meet this objective, the PWG documents the results of their work as open standards that define print related protocols, interfaces, procedures, and conventions. A PWG standard is a stable, well understood, and technically competent specification that is widely used with multiple independent and interoperable implementations. Printer manufacturers and vendors of printer related software benefit from the interoperability provided by voluntary conformance to these standards.

For additional information regarding the Printer Working Group visit:

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1. Introduction

This specification defines the "media-col" Job Template attribute and extends the Job management, monitoring, and processing capabilities of IPP. This specification obsoletes portions of the previous version of this specification [PWG5100.7-2019] - a list of changes can be found in section 16. This specification also incorporates portions of the original IPP Production Printing Attributes - Set 1 [PWG5100.3-2001], obsolete IPP Job and Printer Extensions - Set 2 [PWG5100.11-2010], and IPP Job and Printer Extensions - Set 3 (JPS3) [PWG5100.13-2012] specifications.

1.1 Document Natural Language and Character Set

Certain Document formats are ambiguous about the natural language and character set used in a file. The Internet Printing Protocol/1.1 [STD92] defines the "document-natural-language" operation attribute to specify the natural language in Document Creation operations but does not provide a way to specify the character set. In addition, there is no way for a Client to discover which languages and character sets are supported by a Printer for a given Document format. This specification defines attributes for specifying and discovering supported languages and character sets.

1.2 Attribute Fidelity

The Internet Printing Protocol/1.1 [STD92] defines the "ipp-attribute-fidelity" operation attribute to enforce the fidelity of all attributes in the Job Creation request. This specification defines an operation attribute to enforce the fidelity of a subset of attributes in the Job Creation request.

1.3 Rendering Optimizations

Most Printers are able to optimize output for different kinds of Document data using a higher resolution for black text and lines, for example. However, the Internet Printing Protocol/1.1 [STD92] only defines the "print-quality" and "printer-resolution" Job Template attributes that specify the overall quality and resolution of the output. This specification defines an attribute with corresponding values for specifying the type of optimizations to perform.

1.4 Printing on a Specific Output Device

The Internet Printing Protocol/1.1 [STD92] defines the "output-device-assigned" Job Status attribute but does not define corresponding Job Template or Printer Description attributes for specifying which Output Device to use for a Job. This specification defines the "output-device" Job Template attribute.

1.5 Results of Job/Document Processing

The Internet Printing Protocol/1.1 [STD92] defines some Job Status attributes and values but none of them provide information about processing issues that do not prevent a Job or Document from being printed. This specification defines attributes and values for discovering those processing issues, as well as access to detailed counters for Input Pages, Impressions, and Media Sheets processed.

1.6 Job Scheduling and Lifecycle

The Internet Printing Protocol/1.1 [STD92] defines the "job-hold-until (keyword | name(MAX))" Job Template attribute to hold a Job for processing until a named time period. This specification defines an additional Job Template attribute that holds the Job for processing until the specified date and time.

This specification also includes the "job-delay-output-until (keyword | name(MAX))" and "job-delay-output-until-time (dateTime)" Job Template attributes [PWG5100.11-2010] that delay output of a Job until the specified time.

In addition, this specification defines Job Template attributes to schedule when a pending Job is canceled automatically, Job Template attributes to specify when a Job should transition from the retained phase to the history phase, and Printer Description attributes to specify how long a Job stays in the history phase.

1.7 Job Operations

The Internet Printing Protocol/1.1 [STD92] defines many operations that operate on a single Job object. This specification defines new operations that:

- Cancel all Jobs on a given Printer;

- Cancel all Jobs owned by a User on a given Printer;

- Close a Job in the 'pending' state that is still open for additional Document submissions; and

- Resubmit an existing Job for processing as a new Job, potentially with different Job Template attributes and values.

This specification also extends the Get-Jobs operation to support additional values for the "which-jobs" operation attribute.

1.8 Obsolete Attributes and Values

The original version of this specification [PWG5100.7-2003] defines several attributes and values that have proven problematic from an interoperability and privacy standpoint. This specification obsoletes these attributes and values.

2. Terminology

2.1 Conformance Terminology

Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD, SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as defined in Key words for use in RFCs to Indicate Requirement Levels [BCP14]. The term CONDITIONALLY REQUIRED is additionally defined for a conformance requirement that applies when a specified condition is true.

The term DEPRECATED is used for previously defined and approved protocol elements that SHOULD NOT be used or implemented. The term OBSOLETE is used for previously defined and approved protocol elements that MUST NOT be used or implemented.

2.2 Printing Terminology

Normative definitions and semantics of printing terms are imported from the Internet Printing Protocol/1.1 [STD92].

Document: An object created and managed by a Printer that contains the description, processing, and status information. A Document object may have attached data and is bound to a single Job.

Job: An object created and managed by a Printer that contains description, processing, and status information. A Job also contains zero or more Document objects.

Job Accounting: Collection of Metadata to audit, bill, or otherwise report on the origin, processing, and disposition of Jobs and Documents [PWG5199.11].

Logical Device: A print server, software service, or gateway that processes Jobs and either forwards or stores the processed Job or uses one or more Physical Devices to render output [STD92].

Output Device: a single Logical or Physical Device [STD92].

Physical Device: A hardware implementation of an endpoint device, e.g., a marking engine, a fax modem, etc. [STD92]

2.3 Protocol Role Terminology

This document also defines the following protocol roles to specify unambiguous conformance requirements:

Client: Initiator of outgoing connections and sender of outgoing operation requests (Hypertext Transfer Protocol -- HTTP/1.1 [STD99] User Agent).

Printer: Listener for incoming connections and receiver of incoming operation requests (Hypertext Transfer Protocol -- HTTP/1.1 [STD99] Server) that represents one or more Physical Devices or a Logical Device.

2.4 Other Terminology

Completed Job: a Job in the 'aborted', 'canceled', or 'completed' state.

Document Creation Operation: operations that accept Document Content. Specifically: Print-Job, Print-URI, Send-Document and Send-URI. Note: Print-Job and Print-URI are both Job Creation and Document Creation operations.

Job Creation Operation: operations that create Job objects, specifically: Print-Job, Print-URI, and Create-Job [STD92].

Not Completed Job: a Job in the 'pending', 'pending-held', 'processing', or 'processing-stopped' state.

Retained Job: a Completed Job whose attributes and Document data are still available to the Printer.

2.5 Acronyms and Organizations

IANA: Internet Assigned Numbers Authority, https://www.iana.org/

IETF: Internet Engineering Task Force, https://www.ietf.org/

ISO: International Organization for Standardization, https://www.iso.org/

PWG: Printer Working Group, https://www.pwg.org/

3. Requirements

3.1 Rationale

The Internet Printing Protocol/1.1 [STD92] defines many attributes and values for specifying how Jobs and Documents are processed by a Printer. Given the need for managing Jobs, specifying Job processing options, and retrieving processing status information, this specification should define:

1. Attributes and values that specify detailed media requirements;
2. Attributes that specify Job accounting identifiers and provide accounting counters;
3. Attributes and values that specify the Document character set and rendering optimizations;
4. An attribute for doing selective fidelity enforcement;
5. A media size for automatically printing Documents on the correct size;
6. Attributes and values that allow a Client to discover the results of Document processing;
7. Attributes for delaying the output from a Job until a specified time period;
8. Attributes for holding a Job until a specified date and time;
9. Attributes for retaining a Job for a specified time period;
10. Attributes for configuring the Job history attributes and time period;
11. Attributes for automatically canceling a Job after a specified time period;
12. Operations for managing one or more Jobs; and
13. Values that allow a Client to monitor specific groups of Jobs.

Rationale for the changes from the previous versions of this specification can be found in section 16.

3.2 Use Cases

3.2.1 Print a Plain Text File

Jane has a plain text file report using a character set other than UTF-8 that she would like to print. She submits the file for printing using her Client software, which allows her to specify the exact character set used for the report.

3.2.2 Print a Document Using a Matching Size

John is viewing a document in a web browser and decides to print it. He submits the file for printing from the browser which specifies the output should be formatted for US Letter or ISO A4 media, as available on the printer.

3.2.3 Force a Document to Print on a Specific Media Size

Elizabeth has a contract that must be printed on US Legal media. She uses her Client software to submit the print job, specifying that US Legal size must be used with no substitutions.

3.2.4 Print a Presentation with Best Quality

Bob wants to print a presentation. He submits the presentation for printing using his Client software, specifying that the output should be optimized for text and graphics.

3.2.5 Print Using a Specific Output Device

Sally needs to print a poster on a specific output device. She uses her Client software to select the large format printer associated with the local print service and submit the poster for printing.

3.2.6 Print Using Loaded Media

User is viewing a photo and would like to print the photo on the largest borderless photographic media loaded on her Printer.

After the User initiates a print from the phone and selects a Printer, the Client automatically selects the largest borderless photographic media loaded on the Selected Printer and the highest print quality. The User selects additional processing intent for the Job and confirms the print action. The Client sends a print job request to the Printer with the Job Ticket and local photo. The Printer validates the Job Ticket and document data and then prints the photo.

Preconditions: Printer can report loaded media information such as size, type, coating, and weight. This may be detected automatically or manually entered by the User or Operation when loading the media.

3.2.7 Print on a Roll

Mike has a series of photos to print on a roll of photo media. Mike submits a multi-document job for printing and specifies that the roll be cut between each document in the job.

3.2.8 Manual Duplex Printing

Larry has a long whitepaper he would like to print 2-sided on an entry-level laser printer without an automatic duplexer accessory. Larry submits the document for printing and specifies 2-sided printing. The Client software queries the Printer to determine the page stacking order and delivery order for both the input and output trays and then sends the even numbered pages in the correct order to the Printer. When those pages have been printed, the Client software instructs Larry to insert the pages back in the input tray in the correct orientation. Once the pages are loaded in the input tray, the Client software sends the odd numbered pages to the Printer.

3.2.9 Monitor Whether Jobs are Printed Correctly

Mary is the administrator for the office printers and wants to know whether users are having difficulty printing their documents. She uses Client software to query the history of jobs on each printer, including any errors or warnings that were encountered during processing.

3.2.10 Hold a Job Until a Specific Date and Time

John wants to withhold printing of a weekly newsletter until Monday morning. He uses his Client software to submit the print job with the correct date and time.

3.2.11 Delay Output Until a Specific Time Period

Bob has a large print job he would like printed overnight. He uses his Client software to submit the job for printing, specifying that output should not begin until 6pm.

3.2.12 Submit a Variable Number of Documents in a Job

Elizabeth has a print job that contains a variable number of documents for printing. She uses her Client software to create a new job and then add each document to the job. When she is sure she has all of the documents for the job, she uses her Client software to close the job so that the printer can begin processing the documents for printing.

3.2.13 Cancel a Job After a Specific Time Period

Sally operates a high-volume printer for her company. She configures the printer to automatically cancel any jobs that take longer than four hours to print so as to maintain the availability of the printer to other users.

3.2.14 Cancel Multiple Jobs

Bob needs to cancel a group of jobs that were incorrectly submitted to a printer. He uses his Client software to send a request to cancel a list of those jobs. The printer then cancels the jobs all at once.

3.2.15 Resubmit a Job

Mary needs to reprint a job with different settings. She uses her Client software to pick a retained job on the printer, chooses the settings to use for the reprint, and submits the reprint request. The printer then makes a copy of the original job, substituting any new settings for the copied job.

3.2.16 Retain Jobs for a Specific Time Period

John's company needs to retain all print jobs for at least one year for legal reasons. He configures the printer with a default retention policy of one year, allowing users to specify longer periods of time as needed.

3.2.17 Keep Job History Information for a Specific Time Period

Bob's company needs to keep an accounting history of all print jobs for at least one year. He configures the printer to keep the job history for at least one year, including the job identifier, owner, name, and number of pages.

3.2.18 Audit Print Usage Via Job Accounting

Jane manages a shared office multifunction device and wants to know who prints, what kinds of Jobs are printed, how those Jobs are submitted, and where are they printed. She configures a Job Accounting service on her network for use with the Printer so that all Job and Printer Generated Metadata is available to the service and she can then generate reports showing the information she is interested in.

3.2.19 Audit Print Content Via Job Accounting

Bob is concerned that the students in his computer lab are printing inappropriate content on the school's color printer. He configures a server on his network to act as a print server that stores copies of every Job so that he can periodically review what is being printed.

3.2.20 Billing Via Job Accounting

Kate is the owner of a managed print service company that supplies printers and print servers to businesses. She collects information about each Job that is printed including whether the Job is printed in color, how many sheets are printed, how many sides are printed, and what finishing options (if any) are used. She uses the collected information to bill each business for their usage and to plan customer visits to perform maintenance or supply additional media, ink, and/or toner based on their usage.

3.2.21 Diagnosing and Debugging Printing Issues Via Job Accounting

Joe is a support technician at Kate's managed print service company. He uses the accounting data to reproduce problems specific to a particular Document, Job, or Client application.

3.2.22 Supplying Optional Information Via Job Accounting

Some of Kate's customers want to know what applications their End Users are printing from. Kate configures the printer server to request the application name from the Client with every Job, and then includes a separate informational report to her customers showing the amount of printing that has occurred for each application. Clients will then show the explicit consent UI whenever an End User submits a print Job.

3.3 Exceptions

3.3.1 Too Many Jobs on a Printer

Jane has several documents to print for a meeting. While submitting the documents for printing from her Client software, the printer responds that there are too many queued jobs.

3.3.2 Too Many Documents in a Job

Bob is submitting multiple documents in a single job. While submitting the documents from his Client software, the printer responds that there are too many documents in the job.

3.4 Out of Scope

The following are considered out of scope for this specification:

1. Definition of new file formats; and
2. Definition of new protocol bindings.

3.5 Design Requirements

The design requirements for this specification are to define:

1. Attributes for supported languages and character sets in Document data;
2. Attributes and values to describe the kind of processing optimizations that should be performed on Document data;
3. An attribute to specify fidelity requirements;
4. Attributes to select an Output Device for printing;
5. Attributes and values to report processing errors and warnings;
6. Attributes to hold Jobs until a specific date and time;
7. Attributes to cancel Jobs after a specific time period;
8. Attributes and values to retain Jobs for a specific time period;
9. Attributes to support Job Accounting;
10. An operation to close an open Job;
11. Attributes and operations to cancel groups of Jobs;
12. An operation to resubmit a Job with new Job Template attributes; and
13. Sections to register all attributes, values, and operations with IANA.

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4. Model

This specification extends the Internet Printing Protocol/1.1 [STD92] model to support specification of detailed media intent, better control the Job life cycle and Job processing, specify detailed banner page and accounting information, and better manage Jobs.

4.1 Media Intent

The Internet Printing Protocol/1.1 [STD92] defines a single Job Template attribute ("media (type2 keyword | name)") for specifying the media intent. Historically some Printers have used common aliases ('folio'), names that combine media size and color ('iso-a4-white'), or names that identify specific input trays ('tray-1'). However, the PWG Media Standardized Names v2.0 (MSN2) [PWG5101.1] have replaced this ad-hoc convention and were specifically written to support media specification using a self-describing "media" value.

This specification defines a new "media-col (collection)" Job/Document Template attribute whose member attributes and values specify media size, color, type, and many other properties. Table 6 lists the "media-col" member attributes. Media size names, colors, and types are defined in [PWG5101.1].

When a Printer receives a "media-col" attribute in a Job Creation or Validate-Job request, it searches for matching "media-col" values. Any member attribute not supplied by the Client can match any supported value of the corresponding member attribute in the Printer. The Printer ignores any member attributes supplied by the Client that are not supported by the Printer.

If the number of matched "media-col" values is 0, the Printer MUST either treat the Client-supplied "media-col" value as an unsupported value [STD92] or accept the "media-col" value and put the Job in the 'pending-held' state if the Job is otherwise accepted.

If the number of matched "media-col" values is 1, the Printer MUST either use this single value of "media-col" as the value specified by the Client or eliminate it if the matching media is unsuitable for the Job.

If the number of matched "media-col" values is 2 or more, the Printer MUST reduce the number of matching "media-col" values in an implementation-defined manner to 1 or 0. To reduce the number of "media-col" values, an implementation SHOULD pick an algorithm that gives reproducible results, such as:

- Apply defaults for member attributes not specified by the Client and perform the matching algorithm again on the matched values. This algorithm may result in 0 matches.

- Find the "closest" or "best" match of the matched "media-col" values, resulting in a single match.

- Find the "closest" or "best" match of the matched "media-col" values that are also ready (i.e. loaded in trays). This algorithm has a chance of being less reproducible but may still be sufficiently reproducible to be useful. This algorithm may yield 0 matches unless there is a fallback such as to the preceding algorithm.

A Printer MUST implement either the above algorithm or one that produces equivalent results.

4.2 Media Capabilities

The Internet Printing Protocol/1.1 [STD92] defines the "media-ready (1setOf (type2 keyword | name))" and "media-supported (1setOf (type2 keyword | name))" Printer Description attributes which provide a list of the ready (loaded) and supported media sizes using the self-describing naming convention defined in PWG Media Standardized Names v2.0 (MSN2) [PWG5101.1]. When a Printer supports a range of media sizes, it reports 'min' and 'max' sizes in the "media-supported" attribute and a 'current' size in the "media-ready" attribute. For roll-fed media, the 'current' size can have a long dimension of '0' indicating the available length is unknown.

This specification adds "media-xxx-supported" Printer attributes that list the supported value for the corresponding "media-xxx" member attributes, "media-col-database (1setOf collection)" (section 6.9.37) for a list of supported "media-col" collection values, and "media-col-ready (1setOf collection)" (section 6.9.38) for a list of ready (loaded) media. The "media-col-database" and "media-col-ready" attributes also provide media source feed orientation and direction. When a Printer supports a range of media sizes, the corresponding "media-size" member attributes in the "media-col-database" attribute use the rangeOfInteger syntax. The "media-size" member attributes in the "media-col-ready" attribute use the integer syntax, with a "y-dimension" value of '0' indicating the available length is unknown.

Because the "media-col-database" and "media-col-ready" collection values contain extended media information, Clients filter the member attributes and values to produce a "media-col" value to supply in a Job Creation or Validate-Job request.

4.3 Job Life Cycle

This specification defines four new attributes to control the Job's life cycle as defined in the Internet Printing Protocol/1.1 [STD92]. The "job-cancel-after (integer(0:MAX))" Job Template attribute (section 6.8.3) requests that a Job be canceled by the Printer if it cannot be processed in the given amount of time.

The "job-retain-until (type2 keyword | name)" (section 6.8.7), "job-retain-until-interval (integer(0:MAX))" (section 6.8.8), and "job-retain-until-time (dateTime)" (section 6.8.9) Job Template attributes specify how long to keep the Job in the retention phase of its life cycle.

4.4 Job Processing

The Internet Printing Protocol/1.1 [STD92] defines the "job-hold-until (type2 keyword | name)" Job Template attribute to hold a Job for processing until a named time period or indefinitely. This specification adds the "job-hold-until-time (dateTime)" Job Template attribute (section 6.8.6) to hold a Job until the specified time.

This specification also adds the "job-delay-output-until (type2 keyword | name)" (section 6.8.4) and "job-delay-output-until-time (dateTime)" (section 6.8.5) Job Template attributes that delay output of a Job to the specified time or time period. A Printer can perform pre-processing of a Job before this time, moving the Job to the 'processing' state and setting the "date-time-at-processing" and "time-at-processing" Job Status attributes [STD92]. The Job then moves to the 'processing-stopped' state until output begins.

Because Job processing is not continuous, accounting solutions cannot simply subtract the "time-at-processing" value from the "time-at-completed" value to compute total processing time. Instead, this specification adds the "job-processing-time (integer(0:MAX))" (section **Error! Reference source not found.**) Job Status attribute to provide this information.

Finally, this specification adds additional counter attributes based on the Imaging System State and Counter MIB v2.0 [PWG5106.3] to report on Impressions, Input Pages, and Media Sheets processed in each Job.

4.5 Banner Pages and Accounting Information

The Internet Printing Protocol/1.1 defines the "job-sheets (type2 keyword | name)" Job Template attribute to request a banner page in the Job output. This specification adds the "job-sheets-col (collection)" Job Template attribute (section 6.8.11) which allows the Client to request the banner page using specific media.

This specification also defines the "job-account-id (name)" (section 6.8.1) and "job-accounting-user-id (name)" (section 6.8.2) Job Template attributes in order to supply account and user identification for use by Job Accounting.

4.6 Job Management

This specification adds four new Job management operations:

- Cancel-Jobs (section 5.1) to cancel all Jobs on a Printer,

- Cancel-My-Jobs (section 5.2) to cancel all Jobs for an End User on a Printer,

- Close-Job (section 5.3) to close a pending Job submission, and

- Resubmit-Job (section 5.4) to reprint a Job.

Note: The Resubmit-Job operation replaces the DEPRECATED Restart-Job [STD92] and Reprocess-Job [RFC3998] operations.

4.7 Client Metadata for Job Accounting

Job Accounting is used for recording information about Jobs and how Printers processed Jobs. This information is used for a variety of purposes. It can be very useful to have information about the Client submitting the Job, or other actors that were responsible for generating the originating document or spool file. This specification defines the "client-info" operation attribute (section 6.1.1) to let a Client supply name and version information about itself and any relevant components providing Job Ticket or content information for the Job.

5. New Operations

5.1 Cancel-Jobs

This REQUIRED operation allows the Operator or Administrator for the Printer to cancel a list of Not Completed Jobs or *all* Not Completed Jobs on the Printer. This operation works like the Cancel-Job operation [STD92] except that it works on a number of Jobs at once. If the Printer cannot cancel all of the requested Jobs successfully, it MUST NOT cancel any and MUST return an error code along with the list of offending "job-id" values.

Access Rights: The authenticated user [STD92] performing this operation must be an Operator or Administrator of the Printer. Otherwise, the Printer MUST reject the operation and return 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.

5.1.1 Cancel-Jobs Request

The following groups of attributes are part of a Cancel-Jobs request.

Group 1: Operation Attributes

> "attributes-charset" (charset) and
> "attributes-natural-language" (naturalLanguage):
>
>> The Client MUST supply and the Printer MUST support both of these attributes.
>
> "printer-uri" (uri):
>
>> The Client MUST supply and the Printer MUST support the "printer-uri" operation attribute which is the target Printer for the operation.
>
> "job-ids" (1setOf integer(1:MAX)):

The Client MAY supply and the Printer MUST support this operation attribute which specifies the target Job(s) for the operation.

"requesting-user-name" (name(MAX)) and
"requesting-user-uri" (uri):

The Client SHOULD supply and the Printer MUST support these attributes.

"message" (text(127)):

The Client MAY supply and the Printer MAY support this attribute, which provides a message to the Operator. How or where to display this message to the Operator (if at all) is an implementation decision.

5.1.2 Cancel-Jobs Response

The following groups of attributes are part of Cancel-Jobs response.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

The Printer MUST return both of these attributes.

"status-message" (text(255)) and/or
"detailed-status-message" (text(MAX)):

The Printer MAY return one or both of these attributes.

Group 2: Unsupported Attributes

See [STD92] for details on returning Unsupported Attributes.

5.2 Cancel-My-Jobs

This REQUIRED operation allows a User to cancel a list of Not Completed Jobs or *all* their own Not Completed Jobs on the Printer. This operation works like the Cancel-Job operation [STD92] except that it works on a number of Jobs at once. If the Printer cannot cancel all of the requested Jobs successfully, it MUST NOT cancel any and MUST return an error code along with the list of offending "job-id" values.

Access Rights: The authenticated user [STD92] performing this operation must be the Job owner. Otherwise, the Printer MUST reject the operation and return 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.

5.2.1 Cancel-My-Jobs Request

The following groups of attributes are part of a Cancel-My-Jobs request.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

The Client MUST supply and the Printer MUST support both of these attributes.

"printer-uri" (uri):

The Client MUST supply and the Printer MUST support the "printer-uri" operation attribute which is the target Printer for the operation.

"job-ids" (1setOf integer(1:MAX)):

The Client MAY supply and the Printer MUST support this operation attribute which specifies the target Job(s) for the operation.

"requesting-user-name" (name(MAX)) and
"requesting-user-uri" (uri):

The Client SHOULD supply and the Printer MUST support these attributes.

"message" (text(127)):

The Client MAY supply and the Printer MAY support this attribute, which provides a message to the Operator. How or where to display this message to the Operator (if at all) is an implementation decision.

5.2.2 Cancel-My-Jobs Response

The following groups of attributes are part of a Cancel-My-Jobs response.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

The Printer MUST return both of these attributes.

"status-message" (text(255)) and/or
"detailed-status-message" (text(MAX)):

The Printer MAY return one or both of these attributes.

Group 2: Unsupported Attributes

> See [STD92] for details on returning Unsupported Attributes.

5.3 Close-Job

This REQUIRED operation allows a Client to close a Job that was created using the Create-Job [STD92] operation. It is semantically similar to a Send-Document [STD92] operation with the "last-document" operation attribute supplied with a 'true' value with no Document data, except that the Printer MUST NOT add an additional Document object when accepting a Close-Job operation.

A Client SHOULD check whether the Printer supports the Close-Job operation by querying the values of the "operations-supported" [STD92] Printer Description attribute.

Access Rights: The authenticated user [STD92] performing this operation must be either the Job owner or an Operator or Administrator of the Printer. Otherwise, the Printer MUST reject the operation and return 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.

5.3.1 Close-Job Request

The following attributes are part of a Close-Job request.

Group 1: Operation Attributes

> "attributes-charset" (charset) and
> "attributes-natural-language" (naturalLanguage):
>
> > The Client MUST supply and the Printer MUST support both of these attributes.
>
> "printer-uri" (uri) and "job-id" (integer(1:MAX)):
>
> > The Client MUST supply and the Printer MUST support the "printer-uri" and "job-id" operation attributes which are the target Job for the operation.
>
> "requesting-user-name" (name(MAX)) and
> "requesting-user-uri" (uri):
>
> > The Client SHOULD supply and the Printer MUST support these attributes.

5.3.2 Close-Job Response

The following attributes are part of a Close-Job response.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

> The Printer MUST return both of these attributes.

"status-message" (text(255)) and/or
"detailed-status-message" (text(MAX)):

> The Printer MAY return one or both of these attributes.

Group 2: Unsupported Attributes

> See [STD92] for details on returning Unsupported Attributes.

Group 3: Job Attributes

"job-state" (type1 enum):

> The Printer MUST return the Job's REQUIRED "job-state" attribute. The value of this attribute along with the value of the "job-state-reasons" attribute is a "snapshot" of the new Job's state when the Printer returns the response.

"job-state-reasons" (1setOf type2 keyword):

> The Printer MUST return the Job's REQUIRED "job-state-reasons" attribute.

"job-state-message" (text(MAX)):

> The Printer SHOULD return the Job's RECOMMENDED "job-state-message" attribute. If the Printer supports this attribute, then it MUST be returned in the response. If this attribute is not returned in the response, the Client can assume that the "job-state-message" attribute is not supported and will not be returned in a subsequent Job query.

"number-of-intervening-jobs" (integer(0:MAX)):

> The Printer SHOULD return the Job's RECOMMENDED "number-of-intervening-jobs" attribute. If the Printer supports this attribute, then it MUST be returned in the response. If this attribute is not returned in the response, the Client can assume that the "number-of-intervening-jobs" attribute is not supported and will not be returned in a subsequent Job query.

5.4 Resubmit-Job

This RECOMMENDED operation allows a Client to create a copy of a Retained Job and change or add attributes for the new Job. Once accepted, a Printer MUST create a new Job object and assign a unique "job-id" and "job-uri" value for the new Job, just as if the Client

had sent a Create-Job request. Operation and Job Template attributes from the original Job are copied to the new Job unless overridden in the Resubmit-Job request. If any of the Documents in the Job were passed by reference (Print-URI or Send-URI), the Printer MUST re-fetch the data.

Printers MUST reject a Resubmit-Job request if the Job is not retained or is in the 'pending', 'pending-held', 'processing', or 'processing-stopped' states with the status 'client-error-not-possible'. Otherwise, the Printer returns a status code as defined for the Print-Job [STD92] operation.

Access Rights: The authenticated user [STD92] performing this operation must be either the Job owner or an Operator or Administrator of the Printer. Otherwise, the Printer MUST reject the operation and return 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.

5.4.1 Resubmit-Job Request

The following attributes are part of a Resubmit-Job request.

Group 1: Operation Attributes

> "attributes-charset" (charset) and
> "attributes-natural-language" (naturalLanguage):
>
>> The Client MUST supply and the Printer MUST support both of these attributes.
>
> "printer-uri" (uri) and "job-id" (integer(1:MAX)):
>
>> The Client MUST supply and the Printer MUST support the "printer-uri" and "job-id" operation attributes which are the target Job for the operation.
>
> "requesting-user-name" (name(MAX)) and
> "requesting-user-uri" (uri):
>
>> The Client SHOULD supply and the Printer MUST support these attributes.
>
> "ipp-attribute-fidelity" (boolean) or "job-mandatory-attributes" (1setOf keyword):
>
>> The Client MAY supply and the Printer MUST support either of these attributes.

Group 2: Job Template Attributes

> The Client MAY supply and the Printer MUST support Job Template attributes to apply to the newly created Job. The 'delete-attribute' out-of-band value MAY be used to remove an attribute that was specified in the original Job.

5.4.2 Resubmit-Job Response

The following attributes are part of a Resubmit-Job response.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

The Printer MUST return both of these attributes.

"status-message" (text(255)) and/or
"detailed-status-message" (text(MAX)):

The Printer MAY return one or both of these attributes.

Group 2: Unsupported Attributes

See [STD92] for details on returning Unsupported Attributes.

Group 3: Job Attributes

"job-id" (integer(1:MAX)):

The Printer MUST return the new Job's "job-id" attribute.

"job-state" (type1 enum):

The Printer MUST return the Job's REQUIRED "job-state" attribute. The value of this attribute along with the value of the "job-state-reasons" attribute is a "snapshot" of the new Job's state when the Printer returns the response.

"job-state-reasons" (1setOf type2 keyword):

The Printer MUST return the Job's REQUIRED "job-state-reasons" attribute.

"job-state-message" (text(MAX)):

The Printer SHOULD return the Job's RECOMMENDED "job-state-message" attribute. If the Printer supports this attribute, then it MUST be returned in the response. If this attribute is not returned in the response, the Client can assume that the "job-state-message" attribute is not supported and will not be returned in a subsequent Job query.

"job-uri" (uri):

The Printer MUST return the new Job's "job-uri" attribute.

"number-of-intervening-jobs" (integer(0:MAX)):

The Printer SHOULD return the Job's RECOMMENDED "number-of-intervening-jobs" attribute. If the Printer supports this attribute, then it MUST be returned in the response. If this attribute is not returned in the response, the Client can assume that the "number-of-intervening-jobs" attribute is not supported and will not be returned in a subsequent Job query.

6. New Attributes

6.1 Operation Attributes

Table 1 lists the new operation attributes.

Table 1 - Operation Attributes

Attribute	Printer Conformance	Reference
client-info (1setOf collection)	RECOMMENDED	Section 6.1.1
document-format-details (collection)	DEPRECATED	Section 6.1.2
job-hold-until-time (dateTime)	RECOMMENDED	Section 6.1.3
job-ids (1setOf integer(1:MAX))	REQUIRED	Section 6.1.4
job-mandatory-attributes (1setOf keyword)	REQUIRED	Section 6.1.5

6.1.1 client-info (1setOf collection)

This RECOMMENDED operation attribute supplies information identifying the name and version of the Client and software packages contributing content to a Job Creation Operation. This might include the originating application and any intermediate modules transforming the Document content or the Job Ticket. If the Printer supports this operation attribute, it MUST copy this attribute to the corresponding Job Status attribute of the same name (section 6.7.1) when processing Job Creation operation requests.

Table 2 - "client-info" Member Attributes

Member Attribute	Printer Conformance
client-name (name(127))	REQUIRED
client-patches (text(255) | no-value)	REQUIRED
client-string-version (text(127))	REQUIRED
client-type (type2 enum)	REQUIRED
client-version (octetString(64) | no-value)	REQUIRED

6.1.1.1 client-name (name(127))

This REQUIRED member attribute supplies the human-readable name of the Client or module contributing to the request.

6.1.1.2 client-patches (text(255) | no-value)

This REQUIRED member attribute supplies the list of patches installed. A Client supplies the 'no-value' out-of-band value if there are no patches to report.

6.1.1.3 client-string-version (text(127))

This REQUIRED member attribute supplies the human-readable version string.

6.1.1.4 client-type (type2 enum)

This REQUIRED member attribute indicates the type of module described by the collection. Standard values for "client-type" include:

'3' (application): An application.

'4' (operating-system): An operating system.

'5' (driver): A printer or other driver.

'6' (other): Another kind of software on the Client.

6.1.1.5 client-version (octetString(64) | no-value)

This REQUIRED member attribute supplies the machine-readable version value. A Client supplies the 'no-value' out-of-band value if the module has only a string version value supplied by the "client-string-version" attribute (section 6.1.1.3).

6.1.2 document-format-details (collection)

This DEPRECATED attribute specifies details about the source of the Document data and can be included in any Job or Document Creation request. The "client-info" operation attribute (section 6.1.1) SHOULD be used instead to supply Client operating system and application information.

The values supplied by a Client are purely informational and MUST NOT be used for access control, accounting, or policy enforcement. Table 3 lists the member attributes.

Note: The previous version of this document [PWG5100.7-2003] allowed Clients to send multiple values for this attribute to support "packaging" MIME media types. However, since such formats are not used for IPP printing, Clients MUST NOT send and Printers MUST NOT accept multiple values for "document-format-details".

Table 3 - "document-format-details" Member Attributes

Member Attribute
document-source-application-name (name(MAX))
document-source-application-version (text(127))
document-source-os-name (name(40))
document-source-os-version (text(40))

6.1.2.1 document-source-application-name (name(MAX))

This member attribute identifies the application that generated the Document data. The value MUST be all lowercase with any version number portion removed in order to facilitate matching, e.g., "photoshop", "microsoft word", "unknown", etc. The version number MUST NOT be included in this attribute since the "document-source-application-version" member attribute contains that information.

6.1.2.2 document-source-application-version (text(127))

This member attribute identifies the version number of the application that created the Document data. If specified, the "document-source-application-name" member attribute MUST also be specified. The value MUST be all lowercase in order to facilitate matching, e.g., "8.1 (4331)", "5.0.5 10/26/2001", "2000 (9.0.4119 sr-1)", etc.

6.1.2.3 document-source-os-name (name(40))

This member attribute identifies the name of the operating system that created the Document data. The value MUST be all lowercase with any version number portion removed in order to facilitate matching, e.g., "android", "chromeos", "ios", "linux", "macos", "solaris", "unix", "windows", etc. The version number MUST NOT be included in this attribute since the "document-source-os-version" member attribute contains that information.

Note: The previous version of this specification [PWG5100.7-2003] specified that the IANA Operating System name registry was the source of values, however since this registry is no longer being updated implementors can simply use the marketing name of the Client operating system.

6.1.2.4 document-source-os-version (text(40))

This member attribute identifies the version number of the operating system that created the Document data. If specified, the "document-source-os-name" member attribute MUST also be specified. The value MUST be all lowercase in order to facilitate matching, e.g., "10.14.4", "18.04", "10 (1903)", etc.

6.1.3 job-hold-until-time (dateTime)

This RECOMMENDED attribute specifies the date and time after which the Job MUST become a candidate for processing. Printers that support this attribute MUST support the "job-hold-until" [STD92] operation attribute.

Clients MUST NOT supply both the "job-hold-until-time" and "job-hold-until" [STD92] operation attributes in a Hold-Job request. If a Client supplies both attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

6.1.4 job-ids (1setOf integer(1:MAX))

This REQUIRED attribute specifies a list of "job-id" [STD92] values for the Cancel-Jobs (section 5.1), Cancel-My-Jobs (section 5.2), and Get-Jobs (section 7.2) operations.

6.1.5 job-mandatory-attributes (1setOf keyword)

This REQUIRED attribute identifies which Job Template attributes the Printer MUST support in the Job Creation request in order to accept the Job. The values are the names of Job Template attributes, for example: 'job-hold-until', 'copies', and 'media'. In order to identify a member attribute of a collection attribute, the keyword names of both the collection attribute and the member attribute are given separated by a period (.) character. For example, to make the "media" attribute of the "cover-front" collection attribute mandatory, supply the keyword value 'cover-front.media'.

Note: As with "ipp-attribute-fidelity", the "job-mandatory-attributes" attribute does not determine whether the Printer overrides the PDL with the identified Job Template attributes, as that functionality is defined by the "pdl-override-supported" Printer Description attribute [STD92].

6.2 Document and Job Status Attributes

Table 4 lists the new Document and Job Status attributes.

Table 4 - Document and Job Status Attributes

Attribute	Printer Conformance	Reference
document-format-details (collection)	DEPRECATED	Section 6.2.1
document-format-details-detected (collection)	DEPRECATED	Section 6.2.2
errors-count (integer(0:MAX))	RECOMMENDED	Section 6.2.3
print-content-optimize-actual (1setOf type2 keyword)	RECOMMENDED	Section 6.2.4
warnings-count (integer(0:MAX))	RECOMMENDED	Section 6.2.5

6.2.1 document-format-details (collection)

This DEPRECATED attribute specifies details about the source of the Document data as provided by the Client in the operation attribute of the same name (section 6.1.1).

6.2.2 document-format-details-detected (collection)

This DEPRECATED attribute specifies details about the source of the Document data as detected by the Printer. Member attributes are the same as for the "document-format-details" operation attribute (section 6.1.1).

6.2.3 errors-count (integer(0:MAX))

This RECOMMENDED attribute reports the number of errors encountered processing the Job as a whole. An error is reported when some portion of the printed output is not present, such as a glyph encountered which isn't in a Printer's font or an image in a page was in a format that the Printer didn't support, though the Printer did support the overall Document format.

6.2.4 print-content-optimize-actual (1setOf type2 keyword)

This RECOMMENDED attribute reports the "print-content-optimize" value(s) that the Printer actually used to produce the Job.

6.2.5 warnings-count (integer(0:MAX))

This RECOMMENDED attribute reports the number of warnings encountered processing the Job as a whole. A warning is reported when no information is lost but the appearance of the printed output might not be as expected.

6.3 Document and Job Template Attributes

Table 5 lists the new Document and Job Template attributes.

Table 5 - Document and Job Template Attributes

Attribute	Printer Conformance	Reference
media-col (collection)	REQUIRED	Section 6.3.1
output-device (name(127))	OPTIONAL	Section 6.3.2
print-content-optimize (type2 keyword)	RECOMMENDED	Section 6.3.3

6.3.1 media-col (collection)

This REQUIRED attribute augments the "media" Job Template attribute [STD92] and allows a Client to specify detailed media characteristics for the Job. Each member attribute of the collection identifies a media characteristic. Printers that support the "media-col" attribute MUST also support the "media" attribute.

If a Client supplies both the "media" and "media-col" attributes in a Job or Document Creation request, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code [STD92].

A "media-col" collection value cannot contain both the "media-size" (section 6.3.1.15) and "media-size-name" (section 6.3.1.16) member attributes. If a Client supplies both of these member attributes in a Job or Document Creation request, the Printer MUST reject the request and return the 'client-error-attributes-or-values-not-supported' status code [STD92].

Table 6 lists the member attributes of the "media-col" collection attribute.

Table 6 - "media-col" Member Attributes

Member Attribute	Printer Conformance	Reference
media-back-coating (type2 keyword | name(MAX))	SHOULD	Section 6.3.1.2
media-bottom-margin (integer(0:MAX))	MUST	Section 6.3.1.3
media-color (type2 keyword | name(MAX))	SHOULD	Section 6.3.1.4
media-front-coating (type2 keyword | name(MAX))	SHOULD	Section 6.3.1.5
media-grain (type2 keyword | name(MAX))	SHOULD	Section 6.3.1.6
media-hole-count (integer(0:MAX))	SHOULD	Section 6.3.1.7
media-info (text(255))	SHOULD	Section 6.3.1.8
media-key (type2 keyword | name(MAX))	SHOULD	Section 6.3.1.9
media-left-margin (integer(0:MAX))	MUST	Section 6.3.1.10
media-order-count (integer(1:MAX))	SHOULD	Section 6.3.1.11
media-pre-printed (type2 keyword | name(MAX))	SHOULD	Section 6.3.1.12
media-recycled (type2 keyword | name(MAX))	SHOULD	Section 6.3.1.13
media-right-margin (integer(0:MAX))	MUST	Section 6.3.1.14
media-size (collection)	MUST	Section 6.3.1.15
media-size-name (type2 keyword | name(MAX))	SHOULD	Section 6.3.1.16
media-source (type2 keyword | name(MAX))	MUST	Section 6.3.1.17
media-source-properties (collection) (note 1)	MUST	Section 6.3.1.18
media-thickness (integer(1:MAX))	SHOULD	Section 6.3.1.19
media-tooth (type2 keyword | name(MAX))	SHOULD	Section 6.3.1.20
media-top-margin (integer(0:MAX))	MUST	Section 6.3.1.21
media-type (type2 keyword | name(MAX))	MUST	Section 6.3.1.22
media-weight-metric (integer(0:MAX))	SHOULD	Section 6.3.1.23

> Note 1: The "media-source-properties" member attribute is only used for values of the "media-col-database" and "media-col-ready" Printer Description attributes.

6.3.1.1 Media Selection and Full-Bleed Printing

The "media-bottom-margin", "media-left-margin", "media-right-margin", and "media-top-margin" member attributes specify the Printer's physical margins, allowing a Printer to determine how the content needs to be printed. A Client specifies that is has borderless or "full-bleed" content by setting all of the margins to 0.

Printers that support full-bleed printing MUST accept margins of 0 and MAY scale and center the print document to fill as needed to achieve full-bleed output. Printers SHOULD use the document Image Box when scaling for full-bleed output.

6.3.1.2 media-back-coating (type2 keyword | name(MAX))

This RECOMMENDED member attribute specifies which pre-process coating has been applied to the back of the desired media. Standard keyword values include:

'none': The media does not have any coating.

'glossy': The media has a "glossy" coating.

'high-gloss': The media has a "high-gloss" coating.

'semi-gloss': The media has a "semi-gloss" coating.

'satin': The media has a "satin" coating.

'matte': The media has a "matte" coating.

6.3.1.3 media-bottom-margin (integer(0:MAX))

The REQUIRED "media-bottom-margin" member attribute defines the Printer's physical bottom margin in hundredths of millimeters from the bottom edge, without respect to the value of the "orientation-requested" Job Template attribute.

6.3.1.4 media-color (type2 keyword | name(MAX))

This RECOMMENDED member attribute specifies the color of the media. Standard keyword values are defined in the PWG Media Standardized Names v2.0 (MSN2) [PWG5101.1].

6.3.1.5 media-front-coating (type2 keyword | name(MAX))

This RECOMMENDED member attribute specifies which pre-process coating has been applied to the front of the desired media. Standard keyword values are the same as the "media-back-coating" member attribute (section 6.3.1.2).

6.3.1.6 media-grain (type2 keyword | name(MAX))

This RECOMMENDED member attribute specifies the desired grain of the media being specified [ISO10175]. Grain affects the curl and the folding of the media. Some marking engines are sensitive to the resulting curl. Standard keyword values for "media-grain" include:

'x-direction': The direction of the paper fibers is in the cross-feed direction of the media.

'y-direction': The direction of the paper fibers is in the feed direction of the media.

6.3.1.7 media-hole-count (integer(0:MAX))

This RECOMMENDED member attribute specifies the number of pre-drilled holes in the desired media. A value of '0' (zero) indicates that no holes are present in the media.

6.3.1.8 media-info (text(255))

This RECOMMENDED member attribute provides a human-readable description of the media.

6.3.1.9 media-key (keyword | name(MAX))

This RECOMMENDED member attribute contains a unique identifier of the media represented as a keyword or name. Valid "media-key" values are also valid "media" values.

Because Printers often support many different kinds and sizes of media, Printers that support this attribute SHOULD automatically assign unique values for all supported combinations of media characteristics, even for values that are locally-defined by an Administrator or Operator. A Client can supply such a Printer-generated value with either the "media-key" member attribute or the "media" Job Template attribute [STD92].

6.3.1.10 media-left-margin (integer(0:MAX))

The REQUIRED "media-left-margin" member attribute defines the Printer's physical left margin in hundredths of millimeters from the left edge, without respect to the value of the "orientation-requested" Job Template attribute.

6.3.1.11 media-order-count (integer(1:MAX))

This RECOMMENDED member attribute indicates the number of Media Sheets, within an ordered sequence of Media Sheets, after which the sequence begins to repeat. For example, third cut tab stock in which all three forms are present has an order count of 3. This is also sometimes called the modulus of the ordered media. Full-cut tab stock can have an order count greater than 1 if it has an ordered sequence, such as a cycle of colors or cycle of pre-printing. If the "media-order-count" is `1`, then all media is the same.

6.3.1.12 media-pre-printed (type2 keyword | name(MAX))

This RECOMMENDED member attribute specifies that the pre-printed characteristics of the desired media. Examples of pre-printed media include forms and company letterhead. The standard keyword values for "media-pre-printed" are:

> **'blank'**: The desired medium is not pre-printed.

> **'pre-printed'**: The desired medium is pre-printed; the other attributes identify which medium instance and so what is actually pre-printed.

> **'letter-head'**: The site-defined letterhead is desired.

6.3.1.13 media-recycled (type2 keyword | name(MAX))

This RECOMMENDED member attribute specifies the recycled characteristics of the media. The standard keyword values are:

'none': The media is not recycled.

'standard': The media is the site-defined standard recycled stock.

If this member attribute is supported, the Printer MUST support at least the 'none' and 'standard' values.

6.3.1.14 media-right-margin (integer(0:MAX))

The REQUIRED "media-right-margin" member attribute defines the Printer's physical right margin in hundredths of millimeters from the right edge, without respect to the value of the "orientation-requested" Job Template attribute.

6.3.1.15 media-size (collection)

This REQUIRED member attribute is a collection that explicitly specifies the numerical media width and height dimensions. Clients SHOULD localize the dimensions to the size names that users are familiar with, such as Letter and A4, and/or provide the exact dimensions units appropriate for the user's locale, e.g. 8.5 x 11" and 210 x 297mm.

A requested media size dimension matches a supported media dimension if it is within an implementation-defined tolerance. For example, PostScript specifies a tolerance of 5 points (5/72 of an inch = 1.7 mm) of a supported dimension, i.e., within 176 units of the value of the dimension.

Table 7 lists the "media-size" collection member attributes.

Table 7 - "media-size" Member Attributes

Member Attribute	Printer Conformance
x-dimension (integer(1:MAX))	MUST
y-dimension (integer(1:MAX))	MUST

6.3.1.15.1 x-dimension (integer(1:MAX))

The REQUIRED "x-dimension" member attribute specifies the width of the media in hundredths of a millimeter (1/2540th of an inch) along the bottom edge of the media.

6.3.1.15.2 y-dimension (integer(1:MAX))

The REQUIRED "y-dimension" member attribute specifies the height of the media in hundredths of a millimeter (1/2540th of an inch) along the left edge of the media.

6.3.1.16 media-size-name (type2 keyword | name(MAX))

The RECOMMENDED "media-size-name" member attribute defines the media size using a PWG media size name [PWG5101.1] instead of the dimensions in the "media-size" member attribute.

6.3.1.17 media-source (type2 keyword | name(MAX))

The REQUIRED "media-source" member attribute specifies the input tray, slot, roll, or other source for the media. The name "media-source" was chosen over "media-input-tray" since the values represent more than trays. Standard keyword values for "media-source" include:

'alternate': The alternate or secondary input tray.

'alternate-roll': The alternate or secondary roll.

'auto': The Printer's automatic choice.

'bottom': The bottom input tray.

'by-pass-tray': The by-pass ("multi-purpose") tray.

'center': The center feed slot/tray.

'disc': The CD/DVD/Bluray disc feed slot/tray.

'envelope': The envelope feed slot/tray.

'hagaki': The Hagaki feed slot/tray.

'large-capacity': The large capacity input tray.

'left': The left feed slot/tray.

'main': The main or primary input tray.

'main-roll': The main or primary roll.

'manual': The manual feed slot.

'middle': The middle input tray.

'photo': The photo feed slot/tray.

'rear': The rear feed slot/tray.

'right': The right feed slot/tray.

'roll-1' to **'roll-10'**: The Nth roll.

'side': The side feed slot/tray.

'top': The topmost input tray.

'tray-1' to **'tray-20'**: The Nth tray.

'virtual': A virtual paper tray used to produce a particular output size from some other media source, e.g. produce A4 output from A3 media, produce A3 output from A0 media using a cutter, etc.

6.3.1.18 media-source-properties (collection)

The REQUIRED "media-source-properties" member attribute is provided in the "media-col-database" and "media-col-ready" collections to describe the media path and natural orientation for the specified collection. For example, when printing an envelope or form it is important to know which orientation to use for the Document Data.

Clients SHOULD use "media-col-ready" instead of "media-col-database" since the latter includes all possible media combinations, including potentially multiple instances of the same media with different "media-source-properties" values.

This member attribute MUST NOT be included in the "media-col" Document and Job Template attributes since it is informational rather than specifying intent.

6.3.1.18.1 media-source-feed-direction (type2 keyword)

This REQUIRED member attribute defines whether the long edge ('long-edge-first') or short edge ('short-edge-first') of the media is pulled from the source.

6.3.1.18.2 media-source-feed-orientation (type2 enum)

This REQUIRED member attribute defines the orientation of the media as pulled from the source. The value is an "orientation-requested" [STD92] enumeration.

6.3.1.19 media-thickness (integer(1:MAX))

This RECOMMENDED member attribute specifies the thickness of the media [JDF] in hundreds of millimeters (1/2540th of an inch).

6.3.1.20 media-tooth (type2 keyword | name(MAX))

This RECOMMENDED member attribute specifies the tooth (or roughness) of the media [ISO10175]. The tooth is particularly important for marking engines that use pens (e.g. plotters) to mark the media - the type of pen used matches the tooth of the media for best resolution.

Standard keyword values for "media-tooth" include:

'antique': Rougher than 'vellum' [JDF].

'calendared': Extra smooth or polished, uncoated paper [JDF].

'coarse': Rough finish.

'fine': Smoother finish than 'smooth'.

'linen': Finish like coarse woven cloth [JDF].

'medium': Regular finish.

'smooth': Smooth finish [JDF].

'stipple': Fine pebble finish [JDF].

'uncalendared': Rough, unpolished and uncoated papers [JDF].

'vellum': Slightly rough surface [JDF].

6.3.1.21 media-top-margin (integer(0:MAX))

The REQUIRED "media-top-margin" member attribute defines the Printer's physical top margin in hundredths of millimeters from the top edge, without respect to the value of the "orientation-requested" Job Template attribute.

6.3.1.22 media-type (type2 keyword | name(MAX))

This REQUIRED member attribute identifies the type of media, for example: 'stationery', 'photographic', 'transparency', 'envelope', and 'labels'. Depending on implementation, the Printer MAY need to behave differently or perform different validation depending on the type of the media. For example, a Printer might prohibit stapling of transparencies or selecting a different paper path for an envelope. Standard keyword values for "media-type" are defined in the PWG Media Standardized Names v2.0 (MSN2) [PWG5101.1].

6.3.1.23 media-weight-metric (integer(0:MAX))

This RECOMMENDED member attribute indicates the weight of the desired media rounded to the nearest whole number of grams per square meter.

6.3.2 output-device (name(127))

This attribute requests a named Output Device for a Printer that fans-out to multiple devices. If omitted, the Printer selects the best Output Device for the Job in an implementation dependent manner.

6.3.3 print-content-optimize (type2 keyword)

This RECOMMENDED attribute specifies the type of content optimization to perform on the Document data. Keyword values specify the type of content to optimize, including:

'auto': Automatically determine the best type of optimization to perform.

'graphic': Graphs and line drawings.

'photo': Photographs.

'text': Text.

'text-and-graphic': Text, graphs, and line drawings.

6.4 Document Description Attributes

6.4.1 pages (integer(0:MAX))

This CONDITIONALLY REQUIRED attribute indicates the total number of Input Pages in the Document. A Printer MUST support this attribute if it supports the "pages-completed" Document Status attribute (section 6.5.1).

6.5 Document Status Attributes

6.5.1 pages-completed (integer(0:MAX))

This RECOMMENDED attribute indicates the total number of Input Pages of the Document that the Printer has processed.

6.6 Job Description Attributes

Table 8 list the new Job Description attributes.

Table 8 - Job Description Attributes

Attribute	Printer Conformance	Reference
job-impressions-col (collection)	C. REQUIRED	Section 6.6.1
job-media-sheets-col (collection)	C. REQUIRED	Section 6.6.2
job-pages (integer(0:MAX))	C. REQUIRED	Section 6.6.3
job-pages-col (collection)	C. REQUIRED	Section 6.6.4

6.6.1 job-impressions-col (collection)

This CONDITIONALLY REQUIRED attribute indicates the total number of Impressions in all the Documents in the Job. A Printer MUST support this attribute if it supports the "job-

impressions-completed-col" Job Status attribute (section 6.7.1). Member attributes are listed in Table 9.

Table 9 - Job Counter Member Attributes

Member Attribute	Usage	Printer Conformance
blank (integer(0:MAX))	All	RECOMMENDED
blank-two-sided (integer(0:MAX))	Impressions & Media Sheets	C. REQUIRED
full-color (integer(0:MAX))	All	C. REQUIRED
full-color-two-sided (integer(0:MAX))	Impressions & Media Sheets	C. REQUIRED
highlight-color (integer(0:MAX))	Impressions & Media Sheets	RECOMMENDED
highlight-color-two-sided (integer(0:MAX))	Impressions & Media Sheets	C. REQUIRED
monochrome (integer(0:MAX))	All	REQUIRED
monochrome-two-sided (integer(0:MAX))	Impressions & Media Sheets	C. REQUIRED

Note 1: CONDITIONALLY REQUIRED for Printers that support two-sided printing.

6.6.1.1 blank (integer(0:MAX))

This RECOMMENDED member attribute indicates the number of blank Impressions, Media Sheets, or Input Pages.

6.6.1.2 blank-two-sided (integer(0:MAX))

This CONDITIONALLY REQUIRED member attribute indicates the number of blank two-sided Impressions or Media Sheets. Printers that support the "blank" member attribute and two-sided printing MUST support this attribute.

6.6.1.3 full-color (integer(0:MAX))

This CONDITIONALLY REQUIRED member attribute indicates the number of full-color Impressions, Media Sheets, or Input Pages. Color Printers MUST support this attribute.

6.6.1.4 full-color-two-sided (integer(0:MAX))

This CONDITIONALLY REQUIRED member attribute indicates the number of full-color two-sided Impressions or Media Sheets. Color Printers that support two-sided printing MUST support this attribute.

6.6.1.5 highlight-color (integer(0:MAX))

This RECOMMENDED member attribute indicates the number of Impressions or Media Sheets using a highlight color.

6.6.1.6 highlight-color-two-sided (integer(0:MAX))

This CONDITIONALLY REQUIRED member attribute indicates the number of two-sided Impressions or Media Sheets using a highlight color. Printers that support the "highlight-color" member attribute and two-sided printing MUST support this attribute.

6.6.1.7 monochrome (integer(0:MAX))

This REQUIRED member attribute indicates the number of monochrome Impressions, Media Sheets, or Input Pages.

6.6.1.8 monochrome-two-sided (integer(0:MAX))

This CONDITIONALLY REQUIRED member attribute indicates the number of monochrome two-sided Impressions or Media Sheets. Printers that support two-sided printing MUST support this attribute.

6.6.2 job-media-sheets-col (collection)

This CONDITIONALLY REQUIRED attribute indicates the total number of Media Sheets in all the Documents in the Job. A Printer MUST support this attribute if it supports the "job-media-sheets-completed-col" Job Status attribute (section 6.7.3). Member attributes are listed in Table 9.

6.6.3 job-pages (integer(0:MAX))

This CONDITIONALLY REQUIRED attribute indicates the total number of Input Pages in all the Documents in the Job. A Printer MUST support this attribute if it supports the "job-pages-completed" Job Status attribute (section 6.7.4).

6.6.4 job-pages-col (collection)

This CONDITIONALLY REQUIRED attribute indicates the total number of Input Pages in all the Documents in the Job. A Printer MUST support this attribute if it supports the "job-pages-completed-col" Job Status attribute (section 6.7.5). Member attributes are listed in Table 9.

6.7 Job Status Attributes

Table 10 lists the new Job Status attributes.

Table 10 - Job Status Attributes

Attribute	Printer Conformance	Reference
client-info (1setOf collection)	C. REQUIRED	Section 6.7.1
job-impressions-completed-col (collection)	RECOMMENDED	Section 6.7.2
job-media-sheets-completed-col (collection)	RECOMMENDED	Section 6.7.3
job-pages-completed (integer(0:MAX))	RECOMMENDED	Section 6.7.4
job-pages-completed-col (collection)	RECOMMENDED	Section 6.7.5
job-processing-time (integer(0:MAX))	RECOMMENDED	Section 6.7.6

6.7.1 client-info (1setOf collection)

This CONDITIONALLY REQUIRED Job Status attribute lists the name and version information for the Client that created the Job, provided by the Client in the "client-info" operation attribute (section 6.1.1). A Printer that supports the "client-info" attribute MUST support this attribute.

6.7.2 job-impressions-completed-col (collection)

This RECOMMENDED attribute indicates the total number of Impressions of the Documents in the Job the Printer has processed. Member attributes are listed in Table 9.

6.7.3 job-media-sheets-completed-col (collection)

This RECOMMENDED attribute indicates the total number of Media Sheets of the Documents in the Job the Printer has processed. Member attributes are listed in Table 9.

6.7.4 job-pages-completed (integer(0:MAX))

This RECOMMENDED attribute indicates the total number of Input Pages of the Documents in the Job the Printer has processed.

6.7.5 job-pages-completed-col (collection)

This RECOMMENDED attribute indicates the total number of Input Pages of the Documents in the Job the Printer has processed. Member attributes are listed in Table 9.

6.7.6 job-processing-time (integer(0:MAX))

This RECOMMENDED attribute reports the number of seconds during which the Printer actively processed the Job. Processing includes document transforms, storage, transmission, and/or printing on the Output Device(s).

6.8 Job Template Attributes

Table 11 lists the new Job Template attributes.

Table 11 - Job Template Attributes

Attribute	Printer Conformance	Reference
job-account-id (name(MAX))	RECOMMENDED	Section 6.8.1
job-accounting-user-id (name(MAX))	RECOMMENDED	Section 6.8.2
job-cancel-after (integer(0:MAX))	RECOMMENDED	Section 6.8.3
job-delay-output-until (type2 keyword | name(MAX))	RECOMMENDED	Section 6.8.4
job-delay-output-until-time (dateTime)	RECOMMENDED	Section 6.8.5
job-hold-until-time (dateTime)	RECOMMENDED	Section 6.8.6
job-retain-until (type2 keyword | name(MAX))	RECOMMENDED	Section 6.8.7
job-retain-until-interval (integer(0:MAX))	RECOMMENDED	Section 6.8.8
job-retain-until-time (dateTime)	RECOMMENDED	Section 6.8.9
job-sheet-message (text(MAX))	RECOMMENDED	Section 6.8.10
job-sheets-col (collection)	RECOMMENDED	Section 6.8.11

6.8.1 job-account-id (name(MAX))

This RECOMMENDED attribute specifies the account associated with the Job, such as a customer name, a sequence of digits referencing an internal billing number, or even a credit card number. How the Printer uses this attribute is implementation dependent.

6.8.2 job-accounting-user-id (name(MAX))

This RECOMMENDED attribute specifies the user ID associated with the account specified by the "job-account-id" attribute (see section 6.8.1) used for this Job. These two attributes can be used for account tracking.

6.8.3 job-cancel-after (integer(0:MAX))

This RECOMMENDED attribute specifies the maximum number of seconds allowed for processing a Job. When specified, the Printer cancels the Job automatically if it cannot be completed within the specified timeframe. The completion timer does not begin until the Job enters the 'processing' state'.

6.8.4 job-delay-output-until (type2 keyword | name(MAX))

This RECOMMENDED attribute specifies a time period in the future when the Printer will produce the output for the Job. If the specified time period has not yet arrived, the Printer MUST set the Job's "job-state-reasons" value to 'job-delay-output-until-specified'. The

Printer MUST NOT produce any output until the time period arrives but MAY perform pre-processing. When the time period arrives, the Job MUST become a candidate for output, including any processing required to produce the output. The only way to alter the delay period for a Job is by using the Set-Job-Attributes [RFC3380] operation.

Standard keyword values for named time periods are:

'day-time': Delay output until daylight, typically 6am to 6pm.

'evening': Delay output until the evening, typically from 6pm to 12am.

'indefinite': Delay output indefinitely; the time period can be changed using the Set-Job-Attributes [RFC3380] operation.

'night': Delay output until the night, typically from 12am to 6am.

'no-delay-output': Do not delay the output.

'second-shift': Delay output until the second work shift, typically from 4pm to 12am.

'third-shift': Delay output until the third work shift, typically from 12am to 8am.

'weekend': Delay output until the weekend.

Clients MUST NOT supply both the "job-delay-output-until" and "job-delay-output-until-time" (section 6.8.5) Job Template attributes in a Job Creation request. If a Client supplies both attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

Note: Unlike the "job-hold-until" [STD92] Job Template attribute, the "job-delay-output-until" attribute does not cause the Job to enter the 'pending-held' state.

6.8.5 job-delay-output-until-time (dateTime)

This RECOMMENDED attribute specifies a date and time when the Printer will produce the output for the Job. If the specified time period has not yet arrived, the Printer MUST set the Job's "job-state-reasons" value to 'job-delay-output-until-specified'. The Printer MUST NOT produce any output until the time period arrives but MAY perform pre-processing. When the time period arrives, the Job MUST become a candidate for output, including any processing required to produce the output. The only way to alter the delay period for a Job is by using the Set-Job-Attributes [RFC3380] operation.

Clients MUST NOT supply both the "job-delay-output-until-time" and "job-delay-output-until" (section 6.8.4) Job Template attributes in a Job Creation request. If a Client supplies both attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

Note: Unlike the "job-hold-until-time" (section 6.8.6) Job Template attribute, the "job-delay-output-until-time" attribute does not cause the Job to enter the 'pending-held' state.

6.8.6 job-hold-until-time (dateTime)

This RECOMMENDED attribute specifies the date and time after which the Job MUST become a candidate for processing. Printers that support this attribute MUST support the "job-hold-until" [STD92] Job Template attribute.

Clients MUST NOT supply both the "job-hold-until-time" and "job-hold-until" [STD92] Job Template attributes in a Job Creation request. If a Client supplies both attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

6.8.7 job-retain-until (type2 keyword | name(MAX))

This RECOMMENDED attribute specifies how long the Job remains in the Job Retention phase of a Job's life cycle [STD92]. Standard values include:

'end-of-day': Retain the Job until the end of the current day.

'end-of-month': Retain the Job until the end of the current month.

'end-of-week': Retain the Job until the end of the current week.

'indefinite': Retain the Job indefinitely.

'none': Do not retain the Job.

Clients MUST NOT supply the "job-retain-until", "job-retain-until-interval" (section 6.8.8), and/or "job-retain-until-time" (section 6.8.9) Job Template attributes together in a Job Creation request. If a Client supplies more than one of these attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

6.8.8 job-retain-until-interval (integer(0:MAX))

This RECOMMENDED attribute specifies the number of seconds the Job remains in the Job Retention phase of a Job's life cycle [STD92].

Clients MUST NOT supply the "job-retain-until" (section 6.8.7), "job-retain-until-interval", and/or "job-retain-until-time" (section 6.8.9) Job Template attributes together in a Job Creation request. If a Client supplies more than one of these attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

6.8.9 job-retain-until-time (dateTime)

This RECOMMENDED attribute specifies the date and time when the Job can leave the Job Retention phase of a Job's life cycle [STD92].

Clients MUST NOT supply the "job-retain-until" (section 6.8.7), "job-retain-until-interval" (section 6.8.8), and/or "job-retain-until-time" Job Template attributes together in a Job Creation request. If a Client supplies more than one of these attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

6.8.10 job-sheet-message (text(MAX))

This RECOMMENDED attribute specifies a message that is delivered with the Job and is printed on the Job Sheet specified by the "job-sheets" [STD92] or "job-sheets-col" (section 6.8.11) Job Template attributes.

6.8.11 job-sheets-col (collection)

This RECOMMENDED attribute augments the "job-sheets" Job Template attribute [STD92] and allows a Client to specify media for Job Sheets that is different than the current media being used for the Job. Table 12 lists the member attributes.

The Client supplies either the "media" or "media-col" member attribute. A Printer receiving a request that contains both member attributes MUST reject the request, return the 'client-error-conflicting-attributes' status code, and return the "job-sheets-col" attribute in the unsupported attributes group.

Table 12 - "job-sheets-col" Member Attributes

Member Attribute	Printer Conformance
job-sheets (type2 keyword | name(MAX))	REQUIRED
media (type2 keyword | name(MAX))	REQUIRED
media-col (collection)	REQUIRED

6.8.11.1 job-sheets (type2 keyword | name(MAX))

This REQUIRED member attribute specifies which Job Sheets to print on the specified media. The values for this member attribute are identical to the keyword and name values for the "job-sheets" Job Template attribute [STD92] itself, including the 'none' value, and convey the same semantics.

6.8.11.2 media (type2 keyword | name(MAX))

This REQUIRED member attribute specifies which media to use for the Job Sheets.

6.8.11.3 media-col (collection)

This REQUIRED member attribute specifies which media to use for the Job Sheets.

6.9 Printer Description Attributes

Table 13 lists the new Printer Description attributes.

Table 13 - Printer Description Attributes

Attribute	Printer Conformance	Reference
client-info-supported (1setOf keyword)	C. REQUIRED	Section 6.9.1
document-charset-default (charset)	C. REQUIRED	Section 6.9.2
document-charset-supported (1setOf charset)	C. REQUIRED	Section 6.9.3
document-format-details-supported (1setOf keyword)	DEPRECATED	Section 6.9.4
document-natural-language-default (naturalLanguage)	C. REQUIRED	Section 6.9.5
document-natural-language-supported (1setOf naturalLanguage)	C. REQUIRED	Section 6.9.6
job-account-id-default (name(MAX) | no-value)	C. REQUIRED	Section 6.9.7
job-account-id-supported (boolean)	C. REQUIRED	Section 6.9.8
job-accounting-user-id-default (name(MAX) | no-value)	C. REQUIRED	Section 6.9.9
job-accounting-user-id-supported (boolean)	C. REQUIRED	Section 6.9.10
job-cancel-after-default (integer(0:MAX) | no-value)	C. REQUIRED	Section 6.9.11
job-cancel-after-supported (rangeOfInteger(0:MAX))	C. REQUIRED	Section 6.9.12
job-creation-attributes-supported (1setOf keyword)	REQUIRED	Section 6.9.13
job-delay-output-until-default (type2 keyword | name(MAX))	C. REQUIRED	Section 6.9.14
job-delay-output-until-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.15
job-delay-output-until-time-supported (rangeOfInteger(0:MAX))	C. REQUIRED	Section 6.9.16
job-history-attributes-configured (1setOf keyword)	REQUIRED	Section 6.9.17
job-history-attributes-supported (1setOf keyword)	REQUIRED	Section 6.9.18
job-history-interval-configured (integer(0:MAX))	REQUIRED	Section 6.9.19
job-history-interval-supported (rangeOfInteger(0:MAX))	REQUIRED	Section 6.9.20
job-hold-until-time-supported (boolean)	C. REQUIRED	Section 6.9.21
job-ids-supported (boolean)	REQUIRED	Section 6.9.22
job-mandatory-attributes-supported (boolean)	REQUIRED	Section 6.9.23

Attribute	Printer Conformance	Reference
job-retain-until-default (type2 keyword | name(MAX))	C. REQUIRED	Section 6.9.24
job-retain-until-interval-default (integer(0:MAX) | no-value)	C. REQUIRED	Section 6.9.25
job-retain-until-interval-supported (rangeOfInteger(0:MAX))	C. REQUIRED	Section 6.9.26
job-retain-until-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.27
job-retain-until-time-supported (boolean)	C. REQUIRED	Section 6.9.28
job-sheets-col-default (collection | no-value)	C. REQUIRED	Section 6.9.29
job-sheets-col-supported (1setOf keyword)	C. REQUIRED	Section 6.9.30
job-spooling-supported (type2 keyword)	REQUIRED	Section 6.9.31
max-client-info-supported (integer(4:MAX))	C. REQUIRED	Section 6.9.32
max-page-ranges-supported (integer(1:MAX))	C. REQUIRED	Section 6.9.33
media-back-coating-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.34
media-bottom-margin-supported 1setOf (integer(0:MAX))	REQUIRED	Section 6.9.35
media-col-database (1setOf collection)	REQUIRED	Section 6.9.36
media-col-default (collection)	REQUIRED	Section 6.9.37
media-col-ready (1setOf collection)	REQUIRED	Section 6.9.38
media-col-supported (1setOf keyword)	REQUIRED	Section 6.9.39
media-color-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.40
media-front-coating-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.41
media-grain-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.42
media-hole-count-supported (1setOf rangeOfInteger(0:MAX))	C. REQUIRED	Section 6.9.43
media-key-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.44
media-left-margin-supported 1setOf (integer(0:MAX))	REQUIRED	Section 6.9.45
media-order-count-supported (1setOf rangeOfInteger(1:MAX))	C. REQUIRED	Section 6.9.46
media-pre-printed-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.47
media-recycled-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.48
media-right-margin-supported 1setOf (integer(0:MAX))	REQUIRED	Section 6.9.49
media-size-supported (1setOf collection)	REQUIRED	Section 6.9.50

Attribute	Printer Conformance	Reference
media-source-supported (1setOf (type2 keyword | name(MAX)))	REQUIRED	Section 6.9.51
media-thickness-supported (1setOf rangeOfInteger(1:MAX))	C. REQUIRED	Section 6.9.52
media-tooth-supported (1setOf (type2 keyword | name(MAX)))	C. REQUIRED	Section 6.9.53
media-top-margin-supported 1setOf (integer(0:MAX))	REQUIRED	Section 6.9.54
media-type-supported (1setOf (type2 keyword | name(MAX)))	REQUIRED	Section 6.9.55
media-weight-supported (1setOf rangeOfInteger(1:MAX))	C. REQUIRED	Section 6.9.56
output-device-supported (1setOf name(127))	C. REQUIRED	Section 6.9.57
print-content-optimize-default (type2 keyword)	C. REQUIRED	Section 6.9.58
print-content-optimize-supported (1setOf type2 keyword)	C. REQUIRED	Section 6.9.59
printer-requested-client-type (1setOf type2 enum)	C. REQUIRED	Section 6.9.60
which-jobs-supported (1setOf type2 keyword)	REQUIRED	Section 6.9.61

6.9.1 client-info-supported (1setOf keyword)

This CONDITIONALLY REQUIRED Printer Description attribute lists the members the Printer supports for the "client-info" operation attribute (section 6.1.1). A Printer that supports the "client-info" attribute MUST support this attribute.

6.9.2 document-charset-default (charset)

This CONDITIONALLY REQUIRED attribute specifies the default charset that the Printer will assume for charset-ambiguous Document formats when the Client omits the "document-charset" operation attribute [PWG5100.5]. Printers that support the "document-charset" operation attribute MUST support this attribute.

6.9.3 document-charset-supported (1setOf charset)

This CONDITIONALLY REQUIRED attribute lists the charsets that the Printer supports for charset-ambiguous Document formats. Printers that support the "document-charset" operation attribute [PWG5100.5] MUST support this attribute.

6.9.4 document-format-details-supported (1setOf keyword)

This DEPRECATED attribute lists the supported member attributes of the "document-format-details" operation attribute (section 6.1.1) and "document-format-details" Document/Job Status attributes (section 6.2.1).

6.9.5 document-natural-language-default (naturalLanguage)

This CONDITIONALLY REQUIRED attribute specifies the default natural language that the Printer will assume for Document data when the Client omits the "document-natural-language" operation attribute [STD92]. Printers that support the "document-natural-language" attribute MUST support this attribute.

6.9.6 document-natural-language-supported (1setOf naturalLanguage)

This CONDITIONALLY REQUIRED attribute lists the natural languages supported for Printer-supported Document formats. Printers that support the "document-natural-language" attribute MUST support this attribute.

6.9.7 job-account-id-default (name(MAX) | no-value)

This CONDITIONALLY REQUIRED attribute specifies the default value of the "job-account-id" Job Template attribute (section 6.8.1). Printers MUST support this attribute if the "job-account-id" attribute is supported.

6.9.8 job-account-id-supported (boolean)

This CONDITIONALLY REQUIRED attribute specifies whether the "job-account-id" Job Template attribute (section 6.8.1) is supported. Printers MUST support this attribute if the "job-account-id" attribute is supported.

6.9.9 job-accounting-user-id-default (name(MAX) | no-value)

This CONDITIONALLY REQUIRED attribute specifies the default value of the "job-accounting-user-id" Job Template attribute (section 6.8.2). Printers MUST support this attribute if the "job-accounting-user-id" attribute is supported.

6.9.10 job-accounting-user-id-supported (boolean)

This CONDITIONALLY REQUIRED attribute specifies whether the "job-accounting-user-id" Job Template attribute (section 6.8.2) is supported. Printers MUST support this attribute if the "job-accounting-user-id" attribute is supported.

6.9.11 job-cancel-after-default (integer(0:MAX) | no-value)

This CONDITIONALLY REQUIRED attribute specifies the default value for the "job-cancel-after" (section 6.8.3) Job Template attribute. Printers that support the "job-cancel-after" attribute MUST support this attribute.

6.9.12 job-cancel-after-supported (rangeOfInteger(0:MAX))

This CONDITIONALLY REQUIRED attribute specifies the range of values supported for the "job-cancel-after" (section 6.8.3) Job Template attribute. Printers that support the "job-cancel-after" attribute MUST support this attribute.

6.9.13 job-creation-attributes-supported (1setOf keyword)

This REQUIRED attribute lists the names of the operation and Job Template attributes that can be sent in a Job Creation or Validate-Job request.

6.9.14 job-delay-output-until-default (type2 keyword | name(MAX))

This CONDITIONALLY REQUIRED attribute specifies the default value of the "job-delay-output-until" (section 6.8.4) Job Template attribute. Printers that support the "job-delay-output-until" attribute MUST support this attribute.

6.9.15 job-delay-output-until-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "job-delay-output-until" (section 6.8.4) Job Template attribute. Printers that support the "job-delay-output-until" attribute MUST support this attribute.

6.9.16 job-delay-output-until-time-supported (rangeOfInteger(0:MAX))

This CONDITIONALLY REQUIRED attribute specifies the range of time values supported by the "job-delay-output-until-time" (section 6.8.5) Job Template attribute. Printers that support the "job-delay-output-until-time" attribute MUST support this attribute.

6.9.17 job-history-attributes-configured (1setOf keyword)

This REQUIRED attribute lists the Job attributes that will be retained in the history phase of each Job. IPP/1.1 [STD92] specifies that at least the "job-id", "job-printer-uri", "job-state", and "job-state-reasons" attributes MUST be retained in the history phase. Printers that support the "job-history-attributes-supported" (section 6.9.18) attribute MUST support this attribute.

6.9.18 job-history-attributes-supported (1setOf keyword)

This REQUIRED attribute lists the Job attributes that can be retained in the history phase of each Job. Printers that support the "job-history-attributes-configured" (section 6.9.17) attribute MUST support this attribute.

6.9.19 job-history-interval-configured (integer(0:MAX))

This REQUIRED attribute specifies the minimum number of seconds that a Job will remain in the history phase of its lifecycle [STD92]. Printers SHOULD have a default configured value of at least 60 seconds to allow Clients to discover the disposition of any Jobs that have reached a terminating state. Printers that support the "job-history-interval-supported" (section 6.9.20) attribute MUST support this attribute.

6.9.20 job-history-interval-supported (rangeOfInteger(0:MAX))

This REQUIRED attribute specifies the range of values that are supported for the "job-history-interval-configured" Printer Description attribute. Printers that support the "job-history-interval-configured" (section 6.9.19) attribute MUST support this attribute.

6.9.21 job-hold-until-time-supported (boolean)

This CONDITIONALLY REQUIRED attributes specifies whether the "job-hold-until-time" Job Template attribute (section 6.8.6) is supported. Printers that support the "job-hold-until-time" attribute MUST support this attribute with a value of 'true'.

6.9.22 job-ids-supported (boolean)

This REQUIRED attribute specifies whether the "job-ids" operation attribute (section 6.1.4) is supported.

6.9.23 job-mandatory-attributes-supported (boolean)

This REQUIRED attribute specifies that the "job-mandatory-attributes" operation attribute (section 6.1.5) is supported. Printers MUST report a value of 'true' for this attribute.

6.9.24 job-retain-until-default (type2 keyword | name(MAX))

This CONDITIONALLY REQUIRED attribute specifies the default value of the "job-retain-until" (section 6.8.7) Job Template attribute. Printers that support the "job-retain-until" attribute MUST support this attribute.

6.9.25 job-retain-until-interval-default (integer(0:MAX) | no-value)

This CONDITIONALLY REQUIRED attribute specifies the default value of the "job-retain-until-interval" (section 6.8.8) Job Template attribute. Printers that support the "job-retain-until-interval" attribute MUST support this attribute.

6.9.26 job-retain-until-interval-supported (rangeOfInteger(0:MAX))

This CONDITIONALLY REQUIRED attribute specifies the supported values of the "job-retain-until-interval" (section 6.8.8) Job Template attribute. Printers that support the "job-retain-until-interval" attribute MUST support this attribute.

6.9.27 job-retain-until-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "job-retain-until" (section 6.8.7) Job Template attribute. Printers that support the "job-retain-until" attribute MUST support this attribute.

6.9.28 job-retain-until-time-supported (rangeOfInteger(0:MAX))

This CONDITIONALLY REQUIRED attribute specifies the supported values of the "job-retain-until-time" (section 6.8.9) Job Template attribute. Printers that support the "job-retain-until-time" attribute MUST support this attribute.

6.9.29 job-sheets-col-default (collection | no-value)

This CONDITIONALLY REQUIRED attribute specifies the default value of the "job-sheets-col" Job Template attribute (section 6.8.11). Printers that support the "job-sheets-col" attribute MUST support this attribute.

6.9.30 job-sheets-col-supported (1setOf keyword)

This CONDITIONALLY REQUIRED attribute lists the supported member attributes of the "job-sheets-col" Job Template attribute (section 6.8.11). Printers that support the "job-sheets-col" attribute MUST support this attribute.

6.9.31 job-spooling-supported (type2 keyword)

This REQUIRED attribute specifies whether Jobs are spooled before the Document data is processed. The value of this attribute returned in a Get-Printer-Attributes response MAY depend on the "document-format" attribute supplied in the Get-Printer-Attributes request [STD92]. If the Printer does not support this attribute, then the spooling behavior is implementation dependent.

Standard keyword values include:

'automatic': The Printer chooses whether to process the Document data as it is received or after spooling (storage).

'spool': The printer processes the Document data after it has been spooled (stored).

'stream': The printer processes the Document data as it is received.

6.9.32 max-client-info-supported (integer(4:MAX))

This CONDITIONALLY REQUIRED Printer Description attribute indicates the maximum number of collections the Printer will accept for the "client-info" operation attribute (section 6.1.1). A Printer that supports the "client-info" attribute MUST support this attribute.

6.9.33 max-page-ranges-supported (integer(1:MAX))

This CONDITIONALLY REQUIRED attribute reports the maximum number of values that are supported in the "page-ranges" Job Template attribute [STD92]. Printers that support the "page-ranges" Job Template attribute MUST support this attribute.

6.9.34 media-back-coating-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "media-back-coating" member attribute (section 6.3.1.2). Printers that support the "media-back-coating" member attribute MUST support this attribute.

6.9.35 media-bottom-margin-supported (1setOf integer(0:MAX))

This REQUIRED attribute lists the supported values for the "media-bottom-margin" member attribute (section 6.3.1.3).

6.9.36 media-col-database (1setOf collection)

This REQUIRED attribute lists the set of pre-defined "media-col" collections available in the Printer's media database. This attribute is similar to "media-col-ready" (section 6.9.38) but returns the entire set of pre-defined "media-col" collections known by the Printer instead of just the media loaded in the Printer.

Because the number and size of values of this attribute can be very large, the Printer MUST NOT return this attribute in the response to the Get-Printer-Attributes operation unless the Client explicitly requests it by including the 'media-col-database' value in the "requested-attributes" [STD92] operation attribute.

In order to limit the number and size of values of this attribute, Printers MAY exclude the "media-source" and/or "media-type" member attributes from collection values when all values of the corresponding member attribute are supported when combined with the other member attributes and values. Similarly, the "media-size" member attributes can be expressed as integer or rangeOfInteger values when representing a single media size or a range of media sizes that are supported by the Printer.

A Printer SHOULD include both the "media-size" and "media-size-name" member attributes in collection values representing a fixed media size and MUST NOT include the "media-size-name" member attribute when the "media-size" member attribute contains a range of dimensions.

Because a Printer may support multiple values for the "media-bottom-margin", "media-left-margin", "media-right-margin", and "media-top-margin" member attributes, a Printer MAY only enumerate the best (smallest) values of these attributes to reduce the number of collection values returned in the "media-col-database" attribute. However, if full-bleed and non-full-bleed margins have a significant performance, scaling, or quality differences, a Printer MUST enumerate both the full-bleed (all zeroes) and smallest non-zero hardware margins in the "media-col-database" attribute.

For example, a Printer that supports ISO A4, ISO DL Envelope, US Letter, US Legal, and US #10 Envelope media, a single removable tray and a multi-purpose tray, and cardstock, envelopes, plain paper, labels, letterhead, and transparency media types might report the following attributes and values:

```
       media-size-supported={...}
       media-source-supported='by-pass-tray','main','manual'
       media-type-supported='cardstock','envelope','labels','stationery',
                             'stationery-letterhead','transparency'
       media-col-database={
         /* ISO A4 cardstock only from manual feed */
         media-size={
           x-dimension=21000
           y-dimension=29700
         }
         media-source='manual'
         media-type='cardstock'
       },{
         /* ISO A4 transparency only from manual feed */
         media-size={
           x-dimension=21000
           y-dimension=29700
         }
         media-source='manual'
         media-type='transparency'
       },{
         /* ISO A4 plain paper from any source */
         media-size={
           x-dimension=21000
           y-dimension=29700
         }
         media-type='stationery'
       },{
         /* ISO A4 letterhead from any source */
         media-size={
           x-dimension=21000
           y-dimension=29700
         }
         media-type='stationery-letterhead'
       },... /* Lots of other values */
```

A Printer that supports "custom" and/or "roll" media sizes will include one or more collection values with "x-dimension" and "y-dimension" ranges, for example:

```
       ...,{
         /* Custom sizes from 3x5 to 8.5x14 inches */
         media-size={
           x-dimension=7620-21590
           y-dimension=12700-35560
         }
       },...
```

6.9.36.1 media-size (collection)

This REQUIRED member attribute contains either the dimensions of a single size or a range of dimensions. The "x-dimension (integer(1:MAX) | rangeOfInteger(1:MAX))" and "y-dimension (integer(1:MAX) | rangeOfInteger(1:MAX))" member attributes specify the size or range in hundredths of millimeters (1/2540th of an inch).

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6.9.37 media-col-default (collection)

This REQUIRED attribute specifies the default value of the "media-col" Job Template attribute (section 6.3.1). Printers that conform to this specification MUST support the "media-default" Printer Description attribute [STD92]. The "media-default" and "media-col-default" Printer attributes MUST both be configured to specify the same media instance. If the Administrator sets one of them to a value (either locally or with the Set-Printer-Attributes [RFC3380] operation), the Printer MUST set the other attribute's value to the same media instance or to the 'unknown' out-of-band value, if there isn't a corresponding value to be set for the other attribute. If a Client attempts to set both attributes, but their values specify different media instances, the Printer MUST reject the Set-Printer-Attributes operation and return the 'client-error-conflicting-attributes' status code.

6.9.38 media-col-ready (1setOf collection)

This REQUIRED attribute lists the "media-col" (section 6.3.1) values representing media that are available for use without human intervention, i.e., the media that are ready to be printed on without interaction. Printers that conform to this specification MUST also support the "media-ready" Printer Description attribute [STD92]. The ith value of the "media-col-ready" attribute corresponds to the ith value of the "media-ready" attribute so that the Client can correlate the media names or keywords with the collection values and determine the characteristics of each ready media instance.

A Printer that has "roll" media sizes will include one or more collection values with "x-dimension" and "y-dimension" specifying the width and remaining length of the loaded rolls, for example:

```
...,{
  /* 24" roll is loaded with 45' remaining */
  media-size={
    x-dimension=60960
    y-dimension=1371600
  }
},...
```

If the remaining length is unknown, the Printer reports a "y-dimension" value of '0':

```
...,{
  /* 24" roll is loaded with unknown remaining length */
  media-size={
    x-dimension=60960
    y-dimension=0
  }
},...
```

6.9.38.1 media-size (collection)

This REQUIRED member attribute contains either the dimensions of a single size or the loaded roll dimensions. The "x-dimension (integer(1:MAX))" and "y-dimension

(integer(0:MAX))" member attributes specify the loaded size in hundredths of millimeters (1/2540th of an inch). A "y-dimension" value of '0' specifies an undefined roll length.

6.9.39 media-col-supported (1setOf keyword)

This REQUIRED attribute lists the supported member attributes of the "media-col" Job/Document Template attribute (section 6.3.1).

6.9.40 media-color-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "media-color" member attribute (section 6.3.1.4). Printers that support the "media-color" member attribute MUST support this attribute.

6.9.41 media-front-coating-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "media-front-coating" member attribute (section 6.3.1.5). Printers that support the "media-front-coating" member attribute MUST support this attribute.

6.9.42 media-grain-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "media-grain" member attribute (section 6.3.1.6). Printers that support the "media-grain" member attribute MUST support this attribute.

6.9.43 media-hole-count-supported (1setOf rangeOfInteger(0:MAX))

This CONDITIONALLY REQUIRED attribute lists the supported ranges of values of the "media-hole-count" member attribute (section 6.3.1.7). Printers that support the "media-hole-count" member attribute MUST support this attribute.

6.9.44 media-key-supported (1setOf (keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "media-key" member attribute (section 6.3.1.9). Printers that support the "media-key" member attribute MUST support this attribute.

6.9.45 media-left-margin-supported (1setOf integer(0:MAX))

This REQUIRED attribute lists the supported values for the "media-left-margin" member attribute (section 6.3.1.10).

6.9.46 media-order-count-supported (1setOf rangeOfInteger(1:MAX))

This CONDITIONALLY REQUIRED attribute lists the ranges of supported values of the "media-order-count" member attribute (section 6.3.1.8). Printers that support the "media-order-count" member attribute MUST support this attribute.

6.9.47 media-pre-printed-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "media-pre-printed" member attribute (section 6.3.1.12). Printers that support the "media-pre-printed" member attribute MUST support this attribute.

6.9.48 media-recycled-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "media-recycled" member attribute (section 6.3.1.13). Printers that support the "media-recycled" member attribute MUST support this attribute and MUST include the 'none' keyword value.

6.9.49 media-right-margin-supported (1setOf integer(0:MAX))

This REQUIRED attribute lists the supported values for the "media-right-margin" member attribute (section 6.3.1.14).

6.9.50 media-size-supported (1setOf collection)

This REQUIRED attribute lists the supported values of the "media-size" member attribute (section 6.3.1.15). Unlike the "media-size" member attribute, the "x-dimension" and "y-dimension" member attributes of "media-size-supported" have a syntax of "integer(1:MAX) | rangeOfInteger(1:MAX)" to allow for arbitrary ranges of sizes for custom and roll-fed media.

6.9.51 media-source-supported (1setOf (type2 keyword | name(MAX)))

This REQUIRED attribute lists the supported values of the "media-source" member attribute (section 6.3.1.17).

6.9.52 media-thickness-supported (1setOf rangeOfInteger(1:MAX))

This CONDITIONALLY REQUIRED attribute lists the ranges of supported values for the "media-thickness" member attribute (section 6.3.1.19). Printers that support the "media-thickness" member attribute MUST support this attribute.

6.9.53 media-tooth-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "media-tooth" member attribute (section 6.3.1.20). Printers that support the "media-tooth" member attribute MUST support this attribute.

6.9.54 media-top-margin-supported (1setOf integer(0:MAX))

This REQUIRED attribute lists the supported values for the "media-top-margin" member attribute (section 6.3.1.21).

6.9.55 media-type-supported (1setOf (type2 keyword | name(MAX)))

This REQUIRED attribute lists the supported values of the "media-type" member attribute (section 6.3.1.22).

6.9.56 media-weight-metric-supported (1setOf rangeOfInteger(1:MAX))

This CONDITIONALLY REQUIRED attribute lists the supported ranges of values of the "media-weight-metric" member attribute (section 6.3.1.23). Printers that support the "media-weight-metric" member attribute MUST support this attribute.

6.9.57 output-device-supported (1setOf name(127))

This CONDITIONALLY REQUIRED attribute lists the supported "output-device" values. Printers MUST support this attribute if the "output-device" Job Template attribute (section 6.3.1) is supported.

6.9.58 print-content-optimize-default (type2 keyword)

This CONDITIONALLY REQUIRED attribute specifies the default "print-content-optimize" (section 6.3.3) value. Printers that support the "print-content-optimize" attribute MUST support this attribute.

6.9.59 print-content-optimize-supported (1setOf type2 keyword)

This CONDITIONALLY REQUIRED attribute lists the supported "print-content-optimize" (section 6.3.3) values. Printers that support the "print-content-optimize" attribute MUST support this attribute.

6.9.60 printer-requested-client-type (1setOf type2 enum)

This RECOMMENDED Printer Description attribute lists the types the Printer is configured to request for the "client-type" member attribute (section 6.1.1.4). If not present, the Printer has no configured type preference.

6.9.61 which-jobs-supported (1setOf type2 keyword)

This REQUIRED attribute lists the supported values for the "which-jobs" operation attribute [STD92] that is used with the Get-Jobs operation [STD92].

6.10 Printer Status Attributes

6.10.1 printer-detailed-status-messages (1setOf text(MAX))

This attribute specifies additional detailed and technical information about the Printer, including information such as fault and warning messages, in the same way that the "job-detailed-status-messages" [STD92] Job Status attribute provides additional information about a Job. Because the messages are human-readable text, Clients MUST NOT attempt to parse the value(s) of this attribute.

7. Additional Semantics for Existing Operations

7.1 Create-Job, Print-Job, Print-URI: "client-info"

When supported by a Printer, Clients MAY supply the "client-info" operation attribute (section 6.1.1) for the Job Creation Operations (Create-Job, Print-Job, and Print-URI). When the "client-info" operation attribute is supplied in a Job Creation Operation, the Printer copies the value into the Job's "client-info" Job Status attribute (section 6.7.1).

7.2 Create-Job, Print-Job, Print-URI, Validate-Job: job-mandatory-attributes

This specification extends the Create-Job, Print-Job, Print-URI, and Validate-Job operations to support the "job-mandatory-attributes" operation attribute (section 6.1.5) in the request sent by the Client, which specifies a list of Job Template attributes that MUST be supported by the Printer for the request to be accepted.

The Client MAY supply and the Printer MUST accept the "job-mandatory-attributes" operation attribute in any Job Creation or Validate-Job request.

The Printer MUST reject the Job Creation request if the Client supplies an unsupported Job Template attribute or value in the request that is included in this list of "job-mandatory-attributes" values.

If the Client supplies both the "job-mandatory-attributes" and "ipp-attribute-fidelity" operation attributes, the Printer MUST ignore the "job-mandatory-attributes" attribute.

7.3 Create-Job, Print-Job, Print-URI: server-error-too-many-jobs Status Code

This specification extends the Job Creation operations to return the 'server-error-too-many-jobs' status code value when the Printer is currently unable to create a new Job object.

7.4 Get-Jobs Operation: "job-ids (1setOf integer(1:MAX))"

The "job-ids" (section 6.1.4) operation attribute, if supplied, specifies a list of target Jobs to be returned in the response to a Get-Jobs [STD92] request. Printers MUST support it in Get-Jobs requests to limit the list of Jobs that are returned.

If the Client supplies the "job-ids" operation attribute in a Get-Jobs request, the Client MUST NOT also supply any of the following operation attributes in the same request: "limit", "my-jobs", or "which-jobs". If the Client does supply prohibited operation attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

7.5 Hold-Job Operation: "job-hold-until-time (dateTime)"

The "job-hold-until-time" (section 6.1.3) operation attribute can be provided to specify a date and time when the Job will become a candidate for processing. Printers that support the "job-hold-until-time" attribute and Hold-Job operation MUST support its use with the Hold-Job operation. If accepted, the "job-hold-until-time" operation attribute is copied to the Job, replacing any existing "job-hold-until" [STD92] or "job-hold-until-time" attribute.

Clients MUST NOT send both the "job-hold-until" [STD92] and "job-hold-until-time" operation attributes in a Hold-Job request. If both attributes are sent, Printers MUST reject the request and return the 'client-error-conflicting-attributes' status code.

7.6 Print-Job, Print-URI, Send-Document, Send-URI: server-error-too-many-documents Status Code

This specification extends the Document Creation operations to return the 'server-error-too-many-documents' status code value when the Printer is currently unable to create a new Document object.

7.7 Set-Job-Attributes Operation: "job-hold-until-time (dateTime)"

The "job-hold-until-time" (section 6.8.6) Job Template attribute can be provided to specify a date and time when the Job will become a candidate for processing. Printers that support the "job-hold-until-time" attribute and Set-Job-Attributes operation MUST support its use with the Set-Job-Attributes operation. If accepted, the "job-hold-until-time" operation attribute is copied to the Job, replacing any existing "job-hold-until" [STD92] or "job-hold-until-time" attribute.

Clients MUST NOT send both the "job-hold-until" [STD92] and "job-hold-until-time" Job Template attributes in a Set-Job-Attributes request. If both attributes are sent, Printers MUST reject the request and return the 'client-error-conflicting-attributes' status code.

8. Additional Values for Existing Attributes

8.1 job-sheets (type2 keyword | name(MAX))

The following additional values are defined for the "job-sheets" Job Template attribute [STD92]:

> **'job-start-sheet'**: A Job Sheet is printed to indicate the start of the Job.

> **'job-end-sheet'**: A Job Sheet is printed to indicate the end of the Job.

> **'job-both-sheets'**: Job Sheets is printed to indicate the start and end of all the output associated with the Job.

> **'first-print-stream-page'**: The first Input Page in the Document Data is printed as the Job Sheet and the Printer's standard Job Sheet is suppressed.

8.2 job-state-reasons (1setOf type2 keyword)

This specification adds the following new keyword values for the "job-state-reasons" Job Status attribute [STD92]:

> **'digital-signature-did-not-verify'**: One or more documents in the Job contains a digital signature that could not be verified by the Printer.

> **'errors-detected'**: The Printer has detected one or more errors during processing of the Job.

> **'job-delay-until-specified'**: The Job's output is delayed because the "job-delay-output-until" or "job-delay-output-until-time" Job Template attribute was specified.

> **'job-spooling'**: The Printer is spooling the Document data before processing it.

> **'job-streaming'**: The Printer is processing the Document data as it is being received, i.e., the Job is not being spooled but rather is being processed in chunks by the Output Device and is being imaged during reception.

> **'warnings-detected'**: The Printer has detected one or more warnings during processing of the Job.

In addition, Printers MUST include the 'job-hold-until-specified' keyword value [STD92] when the Client has specified the "job-hold-until-time" Job Template attribute (section 6.8.6) in the Job Creation request.

8.3 media (type2 keyword | name(MAX))

This specification adds the following new keyword value for the "media" Job Template attribute [STD92]:

'choice_iso_a4_210x297mm_na_letter_8.5x11in': Print using US Letter or ISO A4 media (whichever is available).

Note: The semantics of the 'choice' prefix are documented in the PWG Media Standardized Names v2.0 (MSN2) specification [PWG5101.1].

8.4 pdl-override-supported (type2 keyword)

This specification defines a new 'guaranteed' value for the "pdl-override-supported" [STD92] Printer Description attribute. This value indicates that the Printer guarantees that:

1. Document and/or Job Template attribute values take precedence over instructions of any form embedded anywhere in the Document data;

2. Document and/or Job Template attributes that have only a single supported value take precedence over instructions of any form embedded anywhere in the Document data, even if the attribute is not included in the Job or Document Creation request; and

3. No PDL instruction is performed that does not correspond to a current value in the corresponding "xxx-supported" Printer Description attribute.

If a Printer cannot honor the advertised "pdl-override-supported" value for a Job, it can abort the Job, stop the Printer, hold the Job, or substitute a supported value. This choice can be fixed by the implementation or configurable by the Administrator and can depend on the Document and/or Job Template attribute.

8.5 which-jobs (type2 keyword)

This specification adds the following new keyword values for the "which-jobs" operation attribute [STD92]:

'aborted': Any Job in the 'aborted' state.

'all': All Jobs regardless of state.

'canceled': Any Job in the 'canceled' state.

'pending': Any Job in the 'pending' state.

'pending-held': Any Job in the 'pending-held' state.

'processing': Any Job in the 'processing' state.

'processing-stopped': Any Job in the 'processing-stopped' state.

9. New Status Codes

This section defines additional status code values.

9.1 server-error-too-many-jobs (0x050B)

The Client has attempted to create a Job using any of the Job Creation operations which would exceed the capacity of the Printer. The Client can retry the unmodified request.

9.2 server-error-too-many-documents (0x050C)

The Client has attempted to create a Document using any of the Document Creation operations which would exceed the capacity of the Printer for this Job. The Client can retry the unmodified request.

10. Obsolete Attributes

10.1 Obsolete Operation Attributes

Table 14 lists the operation attributes from the previous version of this specification [PWG5100.7-2003] which are now OBSOLETE.

Table 14 - OBSOLETE Operation Attributes

Attribute	Notes
document-digital-signature (type2 keyword)	Not usable
document-format-version (text(127))	Interoperability issues

10.2 Obsolete Member Attributes

Table 15 lists the member attributes of the "document-format-details" operation attribute (section) which are now OBSOLETE.

Table 15 - OBSOLETE "document-format-details" Member Attributes

Member Attribute	Notes
document-format (mimeMediaType)	Redundant, security issues
document-format-device-id (text(127))	Too short, not used
document-format-version (text(127))	Redundant, obsolete parent attribute
document-natural-language (1setOf naturalLanguage)	Redundant, not used

10.3 Obsolete Job Status Attributes

Table 16 lists the Job Status attributes from the previous version of this specification [PWG5100.7-2003] which are now OBSOLETE.

Table 16 - OBSOLETE Job Status Attributes

Attribute	Notes
compression-supported (type2 keyword)	Not usable
document-charset-supported (charset)	Superseded by PWG 5100.5
document-digital-signature-supplied (type2 keyword)	Obsolete parent attribute
document-format-supplied (mimeMediaType)	Superseded by PWG 5100.5
document-format-version-supplied (text(127))	Obsolete parent attribute
document-message-supplied (text(MAX))	Superseded by PWG 5100.5
document-name-supplied	Superseded by PWG 5100.5
document-natural-language-supplied (naturalLanguage)	Superseded by PWG 5100.5
ipp-attribute-fidelity (boolean)	Only used at time of creation
job-copies-actual (integer(1:MAX))	Obsolete parent attribute

Attribute	Notes
job-cover-back-actual (collection)	Obsolete parent attribute
job-cover-front-actual (collection)	Obsolete parent attribute
job-finishings-actual (1setOf type2 enum)	Obsolete parent attribute
job-finishings-col-actual (1setOf collection)	Obsolete parent attribute
job-mandatory-attributes (1setOf keyword)	Only used at time of creation
output-device-actual (1setOf name(127))	Redundant

10.4 Obsolete Job Template Attributes

Table 17 lists the Job Templates attributes from the previous version of this specification [PWG5100.7-2003] which are now OBSOLETE.

Table 17 - OBSOLETE Job Template Attributes

Attribute	Notes
job-copies (integer(1:MAX))	Interoperability issues
job-cover-back (collection)	Interoperability issues
job-cover-front (collection)	Interoperability issues
job-finishings (1setOf type2 enum)	Interoperability issues
job-finishings-col (1setOf collection)	Interoperability issues

10.5 Obsolete Printer Description Attributes

The following Printer Description attributes from the previous version of this specification [PWG5100.7-2003] which are now OBSOLETE.

Table 18 - OBSOLETE Printer Description Attributes

Attribute	Notes
document-digital-signature-default (type2 keyword)	Obsolete parent attribute
document-digital-signature-supported (1setOf type2 keyword)	Obsolete parent attribute
document-format-details-default (collection)	Does not make sense
document-format-version-default (text(127))	Obsolete parent attribute
document-format-version-supported (1setOf text(127))	Obsolete parent attribute
job-copies-default (integer(1:MAX))	Obsolete parent attribute
job-copies-supported (rangeOfInteger(1:MAX))	Obsolete parent attribute
job-cover-back-default (collection)	Obsolete parent attribute
job-cover-back-supported (1setOf keyword)	Obsolete parent attribute
job-cover-front-default (collection)	Obsolete parent attribute
job-cover-front-supported (1setOf keyword)	Obsolete parent attribute
job-finishings-col-default (1setOf collection)	Obsolete parent attribute
job-finishings-col-ready (1setOf collection)	Obsolete parent attribute
job-finishings-col-supported (1setOf keyword)	Obsolete parent attribute

Attribute	Notes
job-finishings-default (1setOf type2 enum)	Obsolete parent attribute
job-finishings-ready (1setOf type2 enum)	Obsolete parent attribute
job-finishings-supported (1setOf type2 enum)	Obsolete parent attribute
media-info-supported (boolean)	Unnecessary attribute

11. Obsolete Values

11.1 Obsolete "job-state-reasons" Values

The 'digital-signature-type-not-supported' and 'job-digital-signature-wait' keyword values from the previous version of this specification [PWG5100.7-2003] are now OBSOLETE because the corresponding Job Template attribute is OBSOLETE.

12. Conformance Requirements

12.1 Printer Conformance Requirements

In order for a Printer to claim conformance to this specification, a Printer MUST support:

1. The new operations defined in section 4;
2. The operation attributes defined in 6.1;
3. The Document Description attributes defined in section 6.4;
4. The Document Status attributes defined in sections 6.2 and 6.5;
5. The Document Template attributes defined in section 6.3;
6. The Job Description attributes defined in section 6.6;
7. The Job Status attributes defined in sections 6.2 and 6.7;
8. The Job Template attributes defined in sections 6.3 and 6.8;
9. The Printer Description attributes defined in section 6.9 that correspond to any supported Document/Job Template attributes defined in section 6.3;
10. The Printer Status attributes defined in section 0;
11. The additional semantics defined in section 7;
12. The additional values defined in section 8;
13. The internationalization considerations defined in section 0; and
14. The security considerations defined in section 14.

Printers MUST NOT support the OBSOLETE attributes listed in section 0 and MUST NOT support the OBSOLETE values in section 11.

12.2 Client Conformance Requirements

In order for a Client to claim conformance to this specification, a Client MUST support:

1. The internationalization considerations defined in section 0; and
2. The security considerations defined in section 14.

13. Internationalization Considerations

For interoperability and basic support for multiple languages, conforming implementations MUST support:

1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8) [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
2. The Unicode Format for Network Interchange [RFC5198] which requires transmission of well-formed UTF-8 strings and recommends transmission of normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

Unicode NFC is defined as the result of performing Canonical Decomposition (into base characters and combining marks) followed by Canonical Composition (into canonical composed characters wherever Unicode has assigned them).

WARNING – Performing normalization on UTF-8 strings received from Clients and subsequently storing the results (e.g., in Job objects) could cause false negatives in Client searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now 'hidden').

Implementations of this specification SHOULD conform to the following standards on processing of human-readable Unicode text strings, see:

Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

Unicode Collation Algorithm [UTS10] – sorting

Unicode Locale Data Markup Language [UTS35] – locale databases

Implementations of this specification are advised to also review the following informational documents on processing of human-readable Unicode text strings:

Unicode Character Encoding Model [UTR17] – multi-layer character model

Unicode Character Property Model [UTR23] – character properties

Unicode Conformance Model [UTR33] – Unicode conformance basis

14. Security Considerations

The IPP extensions defined in this document require the same security considerations as defined in the Internet Printing Protocol/1.1 [STD92].

Implementations of this specification SHOULD conform to the following standard on processing of human-readable Unicode text strings, see:

> Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

Implementations of this specification are advised to also review the following informational document on processing of human-readable Unicode text strings:

> Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

15. IANA Considerations

15.1 Attribute Registrations

The attributes defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following location:

> https://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

```
Document Description attributes:                        Reference
-------------------------------                         ---------
pages (integer(0:MAX))                                  [PWG5100.7]

Document Status attributes:                             Reference
--------------------------                              ---------
document-format-details(deprecated) (collection)        [PWG5100.7]
document-format-details-detected(deprecated) (collection) [PWG5100.7]
document-format-supplied(obsolete) (mimeMediaType)      [PWG5100.7]
document-format-version-supplied(obsolete) (text(127))  [PWG5100.7]
document-message-supplied(obsolete) (text(MAX))         [PWG5100.7]
document-name-supplied(obsolete) (name(MAX))            [PWG5100.7]
errors-count (integer(0:MAX))                           [PWG5100.7]
output-device-actual(obsolete) (1setOf name(127))      [PWG5100.7]
pages-completed (integer(0:MAX))                        [PWG5100.7]
print-content-optimize-actual (1setOf type2 keyword)    [PWG5100.7]
warnings-count (integer(0:MAX))                         [PWG5100.7]

Document Template attributes:                           Reference
----------------------------                            ---------
media-col (collection)                                  [PWG5100.7]
  <Any "media-col" member attribute>                    [PWG5100.7]
output-device (name(127))                               [PWG5100.7]
print-content-optimize (type2 keyword)                  [PWG5100.7]
```

```
Job Description attributes:                                 Reference
---------------------------                                 ---------
job-impressions-col (collection)                            [PWG5100.7]
  blank (integer(0:MAX))                                    [PWG5100.7]
  blank-two-sided (integer(0:MAX))                          [PWG5100.7]
  full-color (integer(0:MAX))                               [PWG5100.7]
  full-color-two-sided (integer(0:MAX))                     [PWG5100.7]
  highlight-color (integer(0:MAX))                          [PWG5100.7]
  highlight-color-two-sided (integer(0:MAX))                [PWG5100.7]
  monochrome (integer(0:MAX))                               [PWG5100.7]
  monochrome-two-sided (integer(0:MAX))                     [PWG5100.7]
job-media-sheets-col (collection)                           [PWG5100.7]
  blank (integer(0:MAX))                                    [PWG5100.7]
  blank-two-sided (integer(0:MAX))                          [PWG5100.7]
  full-color (integer(0:MAX))                               [PWG5100.7]
  full-color-two-sided (integer(0:MAX))                     [PWG5100.7]
  highlight-color (integer(0:MAX))                          [PWG5100.7]
  highlight-color-two-sided (integer(0:MAX))                [PWG5100.7]
  monochrome (integer(0:MAX))                               [PWG5100.7]
  monochrome-two-sided (integer(0:MAX))                     [PWG5100.7]
job-pages (integer(0:MAX))                                  [PWG5100.7]
job-pages-col (collection)                                  [PWG5100.7]
  blank (integer(0:MAX))                                    [PWG5100.7]
  full-color (integer(0:MAX))                               [PWG5100.7]
  monochrome (integer(0:MAX))                               [PWG5100.7]

Job Status attributes:                                      Reference
----------------------                                      ---------
client-info (1setOf collection)                             [PWG5100.7]
  <Any "client-info" member attribute>                      [PWG5100.7]
compression-supplied(obsolete) (type2 keyword)              [PWG5100.7]
document-charset-supplied(obsolete) (charset)               [PWG5100.7]
document-digital-signature-supplied(obsolete) (type2 keyword)
                                                            [PWG5100.7]
document-format-details(deprecated) (collection)            [PWG5100.7]
document-format-details-detected(deprecated) (collection)   [PWG5100.7]
document-format-details-supplied(obsolete) (1setOf collection)
                                                            [PWG5100.7]
document-format-supplied(obsolete) (mimeMediaType)          [PWG5100.7]
document-format-version-supplied(obsolete) (text(127))      [PWG5100.7]
document-message-supplied(obsolete) (text(MAX))             [PWG5100.7]
document-name-supplied(obsolete) (name(MAX))                [PWG5100.7]
document-natural-language-supplied(obsolete) (naturalLanguage)
                                                            [PWG5100.7]
errors-count (integer(0:MAX))                               [PWG5100.7]
ipp-attribute-fidelity(obsolete) (boolean)                  [PWG5100.7]
job-copies-actual(obsolete) (integer(1:MAX))                [PWG5100.7]
job-cover-back-actual(obsolete) (collection)                [PWG5100.7]
job-cover-front-actual(obsolete) (collection)               [PWG5100.7]
job-finishings-actual(obsolete) (1setOf type2 enum)         [PWG5100.7]
job-finishings-col-actual(obsolete) (1setOf collection)     [PWG5100.7]
job-impressions-completed-col (collection)                  [PWG5100.7]
  <Any "job-impressions-col" member attribute>              [PWG5100.7]
job-mandatory-attributes(obsolete) (1setOf keyword)         [PWG5100.7]
job-media-sheets-completed-col (collection)                 [PWG5100.7]
```

```
     <Any "job-media-sheets-col" member attribute>      [PWG5100.7]
job-pages-completed (integer(0:MAX))                     [PWG5100.7]
job-pages-completed-col (collection)                     [PWG5100.7]
     <Any "job-pages-col" member attribute>             [PWG5100.7]
job-processing-time (integer(0:MAX))                     [PWG5100.7]
output-device-actual(obsolete) (1setOf name(127))       [PWG5100.7]
print-content-optimize-actual (1setOf type2 keyword)    [PWG5100.7]
warnings-count (integer(0:MAX))                          [PWG5100.7]

Job Template attributes:                                 Reference
------------------------                                 ---------
job-account-id (name(MAX))                               [PWG5100.7]
job-accounting-user-id (name(MAX))                       [PWG5100.7]
job-cancel-after (integer(0:MAX))                        [PWG5100.7]
job-copies(obsolete) (integer(1:MAX))                    [PWG5100.7]
job-cover-back(obsolete) (collection)                    [PWG5100.7]
job-cover-front(obsolete) (collection)                   [PWG5100.7]
job-delay-output-until (type2 keyword | name(MAX))       [PWG5100.7]
job-delay-output-until-time (dateTime)                   [PWG5100.7]
job-hold-until-time (dateTime)                           [PWG5100.7]
job-finishings(obsolete) (1setOf type2 enum)             [PWG5100.7]
job-finishings-col(obsolete) (1setOf collection)         [PWG5100.7]
job-retain-until (type2 keyword | name(MAX))             [PWG5100.7]
job-retain-until-interval (integer(0:MAX))               [PWG5100.7]
job-retain-until-time (dateTime)                         [PWG5100.7]
job-sheets-col (collection)                              [PWG5100.7]
  job-sheets (type2 keyword | name(MAX))                 [PWG5100.7]
  media (type2 keyword | name(MAX))                      [PWG5100.7]
  media-col (collection)                                 [PWG5100.7]
    <Any "media-col" member attribute>                   [PWG5100.7]
media-col (collection)                                   [PWG5100.7]
  media-back-coating (type2 keyword | name(MAX))         [PWG5100.7]
  media-bottom-margin (integer(0:MAX))                   [PWG5100.7]
  media-color (type2 keyword | name(MAX))                [PWG5100.7]
  media-front-coating (type2 keyword | name(MAX))        [PWG5100.7]
  media-grain (type2 keyword | name(MAX))                [PWG5100.7]
  media-hole-count (integer(0:MAX))                      [PWG5100.7]
  media-info (text(255))                                 [PWG5100.7]
  media-key (keyword | name(MAX))                        [PWG5100.7]
  media-left-margin (integer(0:MAX))                     [PWG5100.7]
  media-order-count (integer(1:MAX))                     [PWG5100.7]
  media-pre-printed (type2 keyword | name(MAX))          [PWG5100.7]
  media-recycled (type2 keyword | name(MAX))             [PWG5100.7]
  media-right-margin (integer(0:MAX))                    [PWG5100.7]
  media-size (collection)                                [PWG5100.7]
    x-dimension (integer(1:MAX))                         [PWG5100.7]
    y-dimension (integer(1:MAX))                         [PWG5100.7]
  media-size-name (type2 keyword | name(MAX))            [PWG5100.7]
  media-source (type2 keyword | name(MAX))               [PWG5100.7]
  media-thickness (integer(1:MAX))                       [PWG5100.7]
  media-tooth (type2 keyword | name(MAX))                [PWG5100.7]
  media-top-margin (integer(0:MAX))                      [PWG5100.7]
  media-type (type2 keyword | name(MAX))                 [PWG5100.7]
  media-weight-metric (integer(0:MAX))                   [PWG5100.7]
output-device (name(127))                                [PWG5100.7]
print-content-optimize (type2 keyword)                   [PWG5100.7]
```

```
Operation attributes:                                        Reference
---------------------                                        ---------
client-info (1setOf collection)                              [PWG5100.7]
  client-name (name(127))                                    [PWG5100.7]
  client-patches (text(255) | 'no-value')                    [PWG5100.7]
  client-string-version (text(127))                          [PWG5100.7]
  client-type (type2 enum)                                   [PWG5100.7]
  client-version (octetString(64) | 'no-value')              [PWG5100.7]
document-digital-signature(obsolete) (type2 keyword)         [PWG5100.7]
document-format-details(deprecated) (collection)             [PWG5100.7]
  document-format(obsolete) (mimeMediaType)                  [PWG5100.7]
  document-format-device-id(obsolete) (text(127))            [PWG5100.7]
  document-format-version(obsolete) (text(127))              [PWG5100.7]
  document-natural-language(obsolete) (1setOf naturalLanguage)
                                                             [PWG5100.7]
  document-source-application-name (name(MAX))               [PWG5100.7]
  document-source-application-version (text(127))            [PWG5100.7]
  document-source-os-name (name(40))                         [PWG5100.7]
  document-source-os-version (text(40))                      [PWG5100.7]
document-format-version(obsolete) (text(127))                [PWG5100.7]
job-hold-until-time (dateTime)                               [PWG5100.7]
job-ids (1setOf integer(1:MAX))                              [PWG5100.7]
job-mandatory-attributes (1setOf keyword)                    [PWG5100.7]

Printer Description attributes:                              Reference
------------------------------                               ---------
client-info-supported (1setOf keyword)                       [PWG5100.7]
document-charset-default (charset)                           [PWG5100.7]
document-charset-supported (1setOf charset)                  [PWG5100.7]
document-digital-signature-default(obsolete) (type2 keyword)
                                                             [PWG5100.7]
document-digital-signature-supported(obsolete) (1setOf type2 keyword)
                                                             [PWG5100.7]
document-format-details-default(obsolete) (collection)       [PWG5100.7]
document-format-details-supported (1setOf keyword)           [PWG5100.7]
document-format-version-default(obsolete) (text(127))        [PWG5100.7]
document-format-version-supported(obsolete) (1setOf text(127))
                                                             [PWG5100.7]
document-natural-language-default (naturalLanguage)          [PWG5100.7]
document-natural-language-supported (1setOf naturalLanguage)
                                                             [PWG5100.7]
job-cancel-after-default (integer(0:MAX) | no-value)         [PWG5100.7]
job-cancel-after-supported (rangeOfInteger(0:MAX))           [PWG5100.7]
job-copies-default(obsolete) (integer(1:MAX))                [PWG5100.7]
job-copies-supported(obsolete) (rangeOfInteger(1:MAX))       [PWG5100.7]
job-cover-back-default(obsolete) (collection)                [PWG5100.7]
job-cover-back-supported(obsolete) (1setOf keyword)          [PWG5100.7]
job-cover-front-default(obsolete) (collection)               [PWG5100.7]
job-cover-front-supported(obsolete) (1setOf keyword)         [PWG5100.7]
job-creation-attributes-supported (1setOf keyword)           [PWG5100.7]
job-delay-output-until-default (type2 keyword | name(MAX))   [PWG5100.7]
job-delay-output-until-interval-supported (rangeOfInteger(0:MAX))
                                                             [PWG5100.7]
job-delay-output-until-supported (1setOf (type2 keyword | name(MAX)))
                                                             [PWG5100.7]
```

```
      job-delay-output-until-time-supported (rangeOfInteger(0:MAX))
                                                          [PWG5100.7]
      job-finishings-col-default(obsolete) (1setOf collection)   [PWG5100.7]
      job-finishings-col-ready(obsolete) (1setOf collection)     [PWG5100.7]
      job-finishings-col-supported(obsolete) (1setOf keyword)    [PWG5100.7]
      job-finishings-default(obsolete) (1setOf type2 enum)       [PWG5100.7]
      job-finishings-ready(obsolete) (1setOf type2 enum)         [PWG5100.7]
      job-finishings-supported(obsolete) (1setOf type2 enum)     [PWG5100.7]
      job-history-attributes-configured (1setOf keyword)         [PWG5100.7]
      job-history-attributes-supported (1setOf keyword)          [PWG5100.7]
      job-history-interval-configured (integer(0:MAX))           [PWG5100.7]
      job-history-interval-supported (rangeOfInteger(0:MAX))     [PWG5100.7]
      job-hold-until-time-supported (boolean)                    [PWG5100.7]
      job-ids-supported (boolean)                                [PWG5100.7]
      job-mandatory-attributes-supported (boolean)               [PWG5100.7]
      job-retain-until-default (type2 keyword | name(MAX))       [PWG5100.7]
      job-retain-until-interval-supported (rangeOfInteger(0:MAX)) [PWG5100.7]
      job-retain-until-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.7]
      job-retain-until-time-supported (rangeOfInteger(0:MAX))    [PWG5100.7]
      job-spooling-supported (type2 keyword)                     [PWG5100.7]
      max-client-info-supported (integer(4:MAX))                 [PWG5100.7]
      max-page-ranges-supported (integer(1:MAX))                 [PWG5100.7]
      media-back-coating-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.7]
      media-bottom-margin-supported (1setOf integer(0:MAX))      [PWG5100.7]
      media-col-database (1setOf collection)                     [PWG5100.7]
        <Any "media-col" member attribute>                       [PWG5100.7]
        media-size (collection                                   [PWG5100.7]
          x-dimension (integer(1:MAX) | rangeOfInteger(1:MAX))   [PWG5100.7]
          y-dimension (integer(1:MAX) | rangeOfInteger(1:MAX))   [PWG5100.7]
        media-source-properties (collection)                     [PWG5100.7]
          media-source-feed-direction (type2 keyword)            [PWG5100.7]
          media-source-feed-orientation (type2 enum)             [PWG5100.7]
      media-col-default (collection)                             [PWG5100.7]
        <Any "media-col" member attribute>                       [PWG5100.7]
      media-col-ready (1setOf collection)                        [PWG5100.7]
        <Any "media-col" member attribute>                       [PWG5100.7]
        media-size (collection                                   [PWG5100.7]
          x-dimension (integer(1:MAX))                           [PWG5100.7]
          y-dimension (integer(0:MAX))                           [PWG5100.7]
        media-source-properties (collection)                     [PWG5100.7]
          media-source-feed-direction (type2 keyword)            [PWG5100.7]
          media-source-feed-orientation (type2 enum)             [PWG5100.7]
      media-col-supported (1setOf keyword)                       [PWG5100.3]
      media-color-supported (1setOf (type2 keyword | name(MAX)))  [PWG5100.7]
      media-front-coating-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.7]
      media-grain-supported (1setOf (type2 keyword | name(MAX)))  [PWG5100.7]
      media-hole-count-supported (1setOf rangeOfInteger(0:MAX))   [PWG5100.7]
      media-key-supported (1setOf (keyword | name(MAX)))          [PWG5100.7]
      media-info-supported(obsolete) (boolean)                   [PWG5100.7]
      media-left-margin-supported (1setOf integer(0:MAX))        [PWG5100.7]
      media-order-count-supported (1setOf rangeOfInteger(1:MAX)) [PWG5100.7]
      media-pre-printed-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.7]
```

```
media-recycled-supported (1setOf (type2 keyword | name(MAX)))
                                                        [PWG5100.7]
media-right-margin-supported (1setOf integer(0:MAX))    [PWG5100.7]
media-size-supported (1setOf collection)                [PWG5100.7]
  x-dimension (integer(1:MAX) | rangeOfInteger(1:MAX))  [PWG5100.7]
  y-dimension (integer(1:MAX) | rangeOfInteger(1:MAX))  [PWG5100.7]
media-source-supported (1setOf (type2 keyword | name(MAX))
                                                        [PWG5100.7]
media-thickness-supported (1setOf rangeOfInteger(1:MAX))  [PWG5100.7]
media-tooth-supported (1setOf (type2 keyword | name(MAX)))  [PWG5100.7]
media-top-margin-supported (1setOf integer(0:MAX))      [PWG5100.7]
media-type-supported (1setOf (type2 keyword | name(MAX)))  [PWG5100.7]
media-weight-metric-supported (1setOf rangeOfInteger(1:MAX))
                                                        [PWG5100.7]
output-device-supported (1setOf name(127))              [PWG5100.7]
print-content-optimize-default (type2 keyword)          [PWG5100.7]
print-content-optimize-supported (1setOf type2 keyword)  [PWG5100.7]
which-jobs-supported (1setOf type2 keyword)             [PWG5100.7]


Printer Status attributes:                              Reference
--------------------------                              ---------
printer-detailed-status-messages (1setOf text(MAX))     [PWG5100.7]
```

15.2 Type2 keyword Value Registrations

The keyword values defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following location:

https://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

```
Attributes (attribute syntax)
  Keyword Attribute Value                               Reference
  -----------------------                               ---------
job-delay-output-until (type2 keyword | name(MAX))      [PWG5100.7]
  day-time                                              [PWG5100.7]
  evening                                               [PWG5100.7]
  indefinite                                            [PWG5100.7]
  night                                                 [PWG5100.7]
  no-delay-output                                       [PWG5100.7]
  second-shift                                          [PWG5100.7]
  third-shift                                           [PWG5100.7]
  weekend                                               [PWG5100.7]
job-delay-output-until-default (type2 keyword | name(MAX))  [PWG5100.7]
  <Any "job-delay-output-until" value>                  [PWG5100.7]
job-delay-output-until-supported (1setOf (type2 keyword | name(MAX)))
                                                        [PWG5100.7]
  <Any "job-delay-output-until" value>                  [PWG5100.7]

job-retain-until (type2 keyword | name(MAX))            [PWG5100.7]
  end-of-day                                            [PWG5100.7]
  end-of-month                                          [PWG5100.7]
  end-of-week                                           [PWG5100.7]
```

```
  indefinite                                              [PWG5100.7]
  none                                                    [PWG5100.7]
job-retain-until-default (type2 keyword | name(MAX))      [PWG5100.7]
  <Any "job-retain-until" value>                          [PWG5100.7]
job-retain-until-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.7]
  <Any "job-retain-until" value>                          [PWG5100.7]

job-sheets (type2 keyword)                                [STD92]
  first-print-stream-page                                 [PWG5100.7]
  job-both-sheets                                         [PWG5100.7]
  job-end-sheet                                           [PWG5100.7]
  job-start-sheet                                         [PWG5100.7]

job-state-reasons (1setOf type2 keyword)                  [STD92]
  digital-signature-did-not-verify                        [PWG5100.7]
  digital-signature-type-not-supported(obsolete)          [PWG5100.7]
  errors-detected                                         [PWG5100.7]
  job-delay-output-until-specified                        [PWG5100.7]
  job-digital-signature-wait(obsolete)                    [PWG5100.7]
  job-spooling                                            [PWG5100.7]
  job-streaming                                           [PWG5100.7]
  warnings-detected                                       [PWG5100.7]

media (type2 keyword | name(MAX))                         [STD92]
  choice_iso_a4_210x297mm_na_letter_8.5x11in              [PWG5100.7]

media-back-coating (type2 keyword | name(MAX))            [PWG5100.7]
media-back-coating-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.7]
  <Any "media-back-coating" value>                        [PWG5100.7]

media-color (type2 keyword | name(MAX))                   [PWG5100.7]
media-color-supported (1setOf (type2 keyword | name(MAX)))  [PWG5100.7]
  <Any "media-color" value>                               [PWG5100.7]

media-front-coating (type2 keyword | name(MAX))           [PWG5100.7]
  <Any "media-back-coating" value>                        [PWG5100.7]
media-front-coating-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.7]
  <Any "media-front-coating" value>                       [PWG5100.7]

media-pre-printed (type2 keyword | name(MAX))             [PWG5100.7]
  blank                                                   [PWG5100.7]
  letter-head                                             [PWG5100.7]
  pre-printed                                             [PWG5100.7]
media-pre-printed-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.7]
  <Any "media-pre-printed" value>                         [PWG5100.7]

media-recycled (type2 keyword | name(MAX))                [PWG5100.7]
  none                                                    [PWG5100.7]
  standard                                                [PWG5100.7]
media-recycled-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.7]
  <Any "media-recycled" value>                            [PWG5100.7]
```

```
media-source-feed-direction (type2 keyword)              [PWG5100.7]
  long-edge-first                                        [PWG5100.7]
  short-edge-first                                       [PWG5100.7]

media-source (type2 keyword | name(MAX))                 [PWG5100.7]
  alternate                                              [PWG5100.7]
  alternate-roll                                         [PWG5100.7]
  auto                                                   [PWG5100.7]
  bottom                                                 [PWG5100.7]
  by-pass-tray                                           [PWG5100.7]
  center                                                 [PWG5100.7]
  disc                                                   [PWG5100.7]
  envelope                                               [PWG5100.7]
  hagaki                                                 [PWG5100.7]
  large-capacity                                         [PWG5100.7]
  left                                                   [PWG5100.7]
  main                                                   [PWG5100.7]
  main-roll                                              [PWG5100.7]
  manual                                                 [PWG5100.7]
  middle                                                 [PWG5100.7]
  photo                                                  [PWG5100.7]
  rear                                                   [PWG5100.7]
  right                                                  [PWG5100.7]
  roll-1                                                 [PWG5100.7]
  roll-10                                                [PWG5100.7]
  roll-2                                                 [PWG5100.7]
  roll-3                                                 [PWG5100.7]
  roll-4                                                 [PWG5100.7]
  roll-5                                                 [PWG5100.7]
  roll-6                                                 [PWG5100.7]
  roll-7                                                 [PWG5100.7]
  roll-8                                                 [PWG5100.7]
  roll-9                                                 [PWG5100.7]
  side                                                   [PWG5100.7]
  top                                                    [PWG5100.7]
  tray-1                                                 [PWG5100.7]
  tray-10                                                [PWG5100.7]
  tray-11                                                [PWG5100.7]
  tray-12                                                [PWG5100.7]
  tray-13                                                [PWG5100.7]
  tray-14                                                [PWG5100.7]
  tray-15                                                [PWG5100.7]
  tray-16                                                [PWG5100.7]
  tray-17                                                [PWG5100.7]
  tray-18                                                [PWG5100.7]
  tray-19                                                [PWG5100.7]
  tray-2                                                 [PWG5100.7]
  tray-20                                                [PWG5100.7]
  tray-3                                                 [PWG5100.7]
  tray-4                                                 [PWG5100.7]
  tray-5                                                 [PWG5100.7]
  tray-6                                                 [PWG5100.7]
  tray-7                                                 [PWG5100.7]
  tray-8                                                 [PWG5100.7]
  tray-9                                                 [PWG5100.7]
```

```
     virtual                                              [PWG5100.7]
  media-source-supported (1setOf (type2 keyword | name(MAX))
                                                          [PWG5100.7]
     <Any "media-source" value>                          [PWG5100.7]

  media-tooth (type2 keyword | name(MAX))                 [PWG5100.7]
  media-tooth-supported (1setOf (type2 keyword | name(MAX)))  [PWG5100.7]
     <Any "media-tooth" value>                            [PWG5100.7]

  media-type (type2 keyword | name(MAX))                  [PWG5100.7]
  media-type-supported (1setOf (type2 keyword | name(MAX)))  [PWG5100.7]
     <Any "media-type" value>                             [PWG5100.7]

  pdl-override-supported (type2 keyword)                  [STD92]
     guaranteed                                           [PWG5100.7]

  print-content-optimize (type2 keyword)                  [PWG5100.7]
     auto                                                 [PWG5100.7]
     graphic                                              [PWG5100.7]
     photo                                                [PWG5100.7]
     text                                                 [PWG5100.7]
     text-and-graphic                                     [PWG5100.7]
  print-content-optimize-actual (1setOf type2 keyword)    [PWG5100.7]
     <Any "print-content-optimize" value>                 [PWG5100.7]
  print-content-optimize-default (type2 keyword)          [PWG5100.7]
     <Any "print-content-optimize" value>                 [PWG5100.7]
  print-content-optimize-supported (1setOf type2 keyword) [PWG5100.7]
     <Any "print-content-optimize" value>                 [PWG5100.7]

  which-jobs (type2 keyword)                              [STD92]
     aborted                                              [PWG5100.7]
     all                                                  [PWG5100.7]
     canceled                                             [PWG5100.7]
     pending                                              [PWG5100.7]
     pending-held                                         [PWG5100.7]
     processing                                           [PWG5100.7]
     processing-stopped                                   [PWG5100.7]
```

15.3 Type2 enum Registrations

The attributes defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following location:

https://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

```
Attributes (attribute syntax)
  Enum Value Enum Symbolic Name                            Reference
  ---------- ------------------                            ---------
client-type (type2 enum)                                   [PWG5100.7]
  3         application                                    [PWG5100.7]
  4         operating-system                               [PWG5100.7]
  5         driver                                         [PWG5100.7]
```

```
     6          other                                    [PWG5100.7]

  media-source-feed-orientation (type2 enum)             [PWG5100.7]
    <Any "orientation-requested" value>                  [PWG5100.7]

  operations-supported (1setOf type2 enum)               [STD92]
    0x0038   Cancel-Jobs                                 [PWG5100.7]
    0x0039   Cancel-My-Jobs                              [PWG5100.7]
    0x003A   Resubmit-Job                                [PWG5100.7]
    0x003B   Close-Job                                   [PWG5100.7]
```

15.4 Operation Registrations

The operations defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

> https://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

```
  Operation Name                              Reference
  --------------                              ---------
  Cancel-Jobs                                 [PWG5100.7]
  Cancel-My-Jobs                              [PWG5100.7]
  Close-Job                                   [PWG5100.7]
  Create-Job(Extension)                       [PWG5100.7]
  Hold-Job(Extension)                         [PWG5100.7]
  Print-Job(Extension)                        [PWG5100.7]
  Print-URI(Extension)                        [PWG5100.7]
  Resubmit-Job                                [PWG5100.7]
  Send-Document(Extension)                    [PWG5100.7]
  Send-URI(Extension)                         [PWG5100.7]
  Set-Job-Attributes(Extension)               [PWG5100.7]
  Validate-Job(Extension)                     [PWG5100.7]
```

15.5 Status Code Registrations

The status codes defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

> https://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

```
  Value    Status Code Name                             Reference
  ------   ---------------------------------------------  ---------
  0x0500:0x05FF - Server Error:
    0x050B server-error-too-many-jobs                   [PWG5100.7]
    0x050C server-error-too-many-documents              [PWG5100.7]
```

16. Overview of Changes

16.1 IPP Job Extensions v2.1

The following changes were made to the 2.0 version of this specification [PWG5100.7-2019]:

- Added a model section to explain how the various attributes, operations, and values are used;

- Added the missing "job-state-reasons" keywords from the OBSOLETE IPP Job and Printer Extensions - Set 2 [PWG5100.11-2010] specification;

- Added the RECOMMENDED "job-processing-time" Job Status attribute to report the amount of time spent processing a Job;

- Added the CONDITIONALLY REQUIRED "job-hold-until-time-supported" Printer Description attribute to indicate support for the "job-hold-until-time" Job Template attribute;

- Added the RECOMMENDED "client-info" operation and Job Status attributes and the CONDITIONALLY REQUIRED "client-info-supported", "max-client-info-supported", and "printer-requested-client-type" Printer Description attributes;

- Added the RECOMMENDED "pages" Document Description attribute;

- Added the RECOMMENDED "pages-completed" Document Status attribute;

- Added the CONDITIONALLY REQUIRED "job-impressions-col", "job-media-sheets-col", "job-pages", and "job-pages-col" Job Description attributes;

- Added the RECOMMENDED "job-impressions-completed-col", "job-media-sheets-completed-col", "job-pages-completed", and "job-pages-completed-col" Job Status attributes;

- Added the CONDITIONALLY REQUIRED "max-page-ranges-supported" Printer Description attribute to report the number of values that are supported for the "page-ranges" Job template attribute;

- Added the 'virtual' keyword value for the "media-source" member attribute;

- Added the 'auto' keyword value for the "print-content-optimize" Job/Document Template attribute;

- Fixed the registration of the "print-content-optimize" keyword values;

- Fixed the registered enum values of the Close-Job and Resubmit-Job operations;

- Fixed the registration of the "media-col-database" and "media-col-ready" Printer attributes; and

- Clarified the definition of the "media-col-database" and "media-col-ready" attributes.

16.2 IPP Job Extensions v2.0

The following changes were made to the 1.0 version of this specification [PWG5100.7-2003]:

- A rationale section was added, including use cases, exceptions, and requirements;

- References now point to the current versions of dependent documents and specifications at the time of publication;

- Read-only attributes are now defined and registered as status attributes;

- A REQUIRED "job-mandatory-attributes-supported" Printer Description attribute has been added to indicate support for the "job-mandatory-attributes" Job Template attribute;

- The RECOMMENDED "job-hold-until-time" and REQUIRED "job-ids" operation attributes were moved from the OBSOLETE IPP Job and Printer Extensions - Set 2 [PWG5100.11-2010] specification;

- The RECOMMENDED "job-delay-output-until", "job-delay-output-until-time", and "job-hold-until-time" Job Template attributes were moved from the OBSOLETE IPP Job and Printer Extensions - Set 2 [PWG5100.11-2010] specification;

- The REQUIRED "job-creation-attributes-supported", "job-spooling-supported", "media-col-database", "printer-detailed-status-messages", and "which-jobs-supported" Printer attributes were moved from the OBSOLETE IPP Job and Printer Extensions - Set 2 [PWG5100.11-2010] specification;

- The RECOMMENDED "job-account-id" and "job-accounting-user-id" Job Template and related Printer Description attributes were moved from the IPP Production Printing Attributes - Set 1 [PWG5100.3-2001] specification;

- The RECOMMENDED "job-sheets-col" Job Template and related Printer Description attributes were moved from the IPP Production Printing Attributes - Set 1 [PWG5100.3-2001] specification;

- The additional values for the "job-sheets" Job Template attribute were moved from the IPP Production Printing Attributes - Set 1 [PWG5100.3-2001] specification;

- The REQUIRED "media-col" Document/Job Template attribute and related Printer Description attributes were moved from the original IPP Production Printing Attributes

- Set 1 [PWG5100.3-2001], OBSOLETE IPP Job and Printer Extensions - Set 2 [PWG5100.11-2010], and IPP Job and Printer Extensions - Set 3 [PWG5100.13-2012] specifications;

- The RECOMMENDED "job-retain-until", "job-retain-until-interval", and "job-retain-until-time" Job Template attributes were added to control the Job Retention phase of a Job's lifecycle;

- The REQUIRED "job-history-attributes-configured", "job-history-attributes-supported", "job-history-interval-configured", and "job-history-interval-supported" Printer Description attributes were added to control the Job History phase of a Job's lifecycle;

- The "document-charset" operation attribute and corresponding operation semantics are now defined in PWG 5100.5: IPP Document Object v1.1;

- The "document-digital-signature" operation attribute and corresponding Document Status, Job Status, and Printer Description attributes have been made OBSOLETE because of interoperability issues;

- The "document-format-details" operation attribute and corresponding Document Status, Job Status, and Printer Description attributes have been made DEPRECATED because of interoperability issues and privacy concerns;

- The "document-format", "document-format-version", and "document-natural-language" member attributes of "document-format-details" have been made OBSOLETE because the attributes are redundant;

- The "document-format-device-id" member attribute of "document-format-details" have been made OBSOLETE because the attribute syntax is too short to be useful;

- The "document-format-version" operation attribute and corresponding Document Status, Job Status, and Printer Description attributes have been made OBSOLETE because of interoperability issues;

- The "job-copies" Job Template attribute and corresponding Job Status and Printer Description attributes have been made OBSOLETE because of interoperability issues;

- The "job-cover-back" Job Template attribute and corresponding Job Status and Printer Description attributes have been made OBSOLETE because of interoperability issues;

- The "job-cover-front" Job Template attribute and corresponding Job Status and Printer Description attributes have been made OBSOLETE because of interoperability issues;

- The "job-finishings" Job Template attribute and corresponding Job Status and Printer Description attributes have been made OBSOLETE because of interoperability issues;

- The "job-finishings-col" Job Template attribute and corresponding Job Status and Printer Description attributes have been made OBSOLETE because of interoperability issues; and

- The 'digital-signature-type-not-supported' and 'job-digital-signature-wait' values for the "job-state-reasons" attribute have been made OBSOLETE because of interoperability issues.

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Implementers of this specification document are encouraged to join the IPP Mailing List in order to participate in any discussions of clarification issues and review of registration proposals for additional attributes and values.

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